GEOTECHNICAL ENGINEERS INC.

FINAL

REPORT

ON

EXPLORATION PROGRAM
NEW BEDFORD SUPERFUND SITE
New Bedford, Massachusetts

November 13, 1987

Presented to

US Army Corps of Engineers
New England Division

Submitted by

G E I
1021 Main Street
Winchester, Massachusetts 01890
(617) 721-4000

Project 87311

Stephen L. Whiteside

Stephen L. Whiteside, P.E.
Project Manager

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CR - Virgin Compression Ratio = $\frac{\Delta\varepsilon_v}{\Delta \log \bar{\sigma}_v}$ from virgin compression

LL - Liquid Limit

PL - Plastic Limit

PI - Plasticity Index = LL - PL

I_L - Liquidity Index = $\frac{W_n - PL}{LL - PL}$

e_o - Initial Void Ratio

W_o - Initial Water Content

W - Natural Water Content

S_o - Initial Degree of Saturation

G - Specific Gravity

$\bar{\sigma}_v$ - Effective Vertical Stress

ε_v - Vertical Strain

c_v - Coefficient of Consolidation

C_α - Coefficient of Secondary Compression = $\frac{\Delta\varepsilon_v}{\Delta \log t}$

q - Shear Stress = $\frac{\sigma_1 - \sigma_3}{2}$

$\bar{p}$ - Mean Effective Stress = $\frac{\bar{\sigma}_1 + \bar{\sigma}_3}{2}$

$\bar{\sigma}_3$ - Effective Minor Principal Stress

$\bar{\sigma}_1$ - Effective Major Principal Stress

U - Pore Pressure

D_c - Specimen Diameter after Consolidation

L_c - Specimen Length after Consolidation

B_c - B-value after consolidation

1. INTRODUCTION

1.1 Purpose

The purpose of this report is to present the results of field and laboratory investigations of the subsurface conditions at the proposed pilot study area for the New Bedford Superfund site cleanup. The results of the investigations will be used by NED-USCE to design a Confined Disposal Facility (CDF) for the pilot study.

1.2 Scope of Work

The scope of work for this project included the following:

1) Engage a drilling subcontractor to drill 15 borings, to excavate 13 test pits, and to obtain undisturbed samples of the soft compressibile harbor-bottom sediments in four of the borings.

2) Survey locations and elevations of the borings and test pits.

3) Prepare a Health and Safety Plan for the work.

4) Observe the borings and test pits. Provide a "clean man" in the field to aid in decontamination of the drilling and engineering personnel.

5) Perform a laboratory testing program to determine the strength, compressibility and index properties of the harbor sediments and grain size distribution of selected onshore fill samples.

6) Prepare draft and final reports on the investigations.

1.3 Authorization

The work presented in this report was authorized by Delivery Order No. 3 of Contract No. DACW33-87-D-0002 between NED-USCE and GEI.

1.4 Project Personnel

The following GEI personnel worked on this project:

Ronald C. Hirschfeld, P.E.	In House Consultant
Stephen L. Whiteside, P.E.	Project Manager
John L. Enos, P.E.	Senior Geotechnical Engineer
Thomas V. May	Geotechnical Engineer
Mark Mahoney	Geologist
Brian Kilcoyne	Geologist

Anne Leifer	Engineering Technician
John McCormick	Engineering Technician

2. SITE AND PROJECT DESCRIPTION

2.1 Site Description

The site is located on the west shore of the Acushnet River in New Bedford, Massachusetts, just north of the Coggeshall St. Bridge, see Fig. 1. Figure 2 is a topographic plan of the site. The site is an approximately 500-foot by 600-foot area east of a soccer field and north of Sawyer St.

The site includes an onshore portion and an off-shore portion. The ground surface in the onshore portion is generally level, ranging from about El. 8 to 12 feet MLW (Mean Low Water). The ground surface at the shore slopes down to the river bottom which is typically at about El. -2 feet MLW within the project area.

The onshore portion of the site is generally covered by brush and small trees. There are numerous piles of trash and debris throughout the site. Several abandoned foundation walls are visible. According to a plan obtained from Commonwealth Electric Co. the site was occupied until about 1940 by mill buildings.

2.2 Project Description

New Bedford Harbor (including the lower portion of the Acushnet river) has been selected as a Superfund cleanup site by the US Environmental Protection Agency (EPA). The upper approximately 3 feet of the harbor sediments contains elevated levels of polychlorinated biphenyls (PCB's) and heavy metals.

A pilot study of dredging and disposal alternatives is being conducted at the site. A pilot Confined Disposal Facility (CDF) will be constructed partially on land and partially in the water. The CDF will consist of a perimeter dike constructed to El. 12 feet MLW. A sheet pile wall will be constructed within the CDF to separate it into two sections. Harbor bottom material will be excavated from outside the CDF and placed into the CDF during the pilot study. The excavated area outside the CDF will be used as a second type of disposal facility known as Confined Aquatic Disposal (CAD). In the CAD contaminated soil is placed in the bottom of the excavated area and is then covered with clean soil.

The field and laboratory investigations conducted for this project provide data on the thickness, strength and compressiblity and index properties of the harbor bottom sediments and on the nature of the subsoils and bedrock beneath the land portion of the CDF.

3. FIELD INVESTIGATION

3.1 General

The field exploration program was developed by NED-USCE and included onshore and offshore borings and onshore test pits. A copy of the NED-USCE Scope of Work is contained in Appendix G. A meeting was held at the site on September 10, 1987 with the drilling subcontractor, GEI and the NED-USCE to discuss the field exploration program.

Beacause the soils at the site are known to be contaminated, a health and safety plan was prepared for the work by GEI. The health and safety plan is discussed in Sec. 3.2 and contained in Appendix D. The major PCB contamination is in the upper approximately 3 feet of the harbor sediments. To minimize exposure of laboratory and field personnel the NED-USCE exploration program did not include obtaining any soil samples of the upper 3 feet of harbor sediments.

Boring and test pit locations and elevations were determined by GEI using NED-USCE control points. Onshore borings and test pits were located using offsets from baselines established by GEI. The offshore borings were located from baseline points using a tape and a Brunton compass. We estimate that the locations of onshore borings and test pits are within about 2 feet of the locations shown on the site plan (Fig. 2). We estimate that the locations of offshore borings are within about 5 feet of the locations shown on the site plan.

Daily Activity Logs are contained in Appendix E and Safety Reports in Appendix F.

3.2 Health and Safety Plan

Due to the known PCB contamination of the harbor bottom sediments a health and safety program was prepared for the offshore borings (Appendix D). All GEI and drilling subcontractor personnel working on the barge used for the offshore borings wore Level C protective equipment. An HNu photoionization device was used to monitor for volatile organic compounds (VOC). No elevated levels of VOC were detected during the offshore portion of the exploration program. A clean man on shore assisted the workers in removal and decontamination of clothing and equipment. All disposable equipment and supplies were placed in two 55-gallon drums at the site. NED-USCE arranged for removal of the drums from the site after completion of the field work.

No contamination was expected for the onshore borings and test pits. However, the HNu photoionization device was used to monitor the ambient air in the vicinity of the land borings and the test pits. In one boring, PD21, an elevated level of VOC was measured in the borehole. The level of VOC in the borehole appeared to be increasing with depth and the hole was terminated at 4 feet. A second boring, PD21A, was performed about 10 feet away from PD21 and no elevated levels of VOC were detected in the borehole or soil samples.

3.3 Boring Program

The boring program consisted of 15 borings performed by Guild Drilling Co. of East Providence, RI between September 14 and 28, 1987. The depths and elevations of the borings are summarized in Table 1. The locations of the borings are shown on Fig. 2.

The borings were observed full time by a GEI field representative. Two drill rigs were used for the exploration program - one land rig and one barge-mounted water rig. In the onshore borings split-spoon samples were taken at standard 5-foot intervals and at observed changes in strata. In selected offshore borings undisturbed tube samples of the harbor sediments were obtained below about 4 feet. A summary of the undisturbed tube samples obtained is given in Table 3. Field vane shear tests (FVST) were performed at about 1.8-foot intervals in the upper 3 to 5 feet of harbor sediments in borings were tubes where taken and throughout the entire thickness of sediments in borings without tube samples. The vane was provided by the NED-USCE and consisted of a 4-inch-diameter by 8-inch-long stainless steel vane. The results of the FVST's are summarized in Table 4. Split-spoon samples were taken in the soils underlying the harbor sediments.

Boring logs prepared by GEI are contained in Appendix A. The logs include the results of the FVST's. The field soil classifications prepared by GEI personnel were edited in the GEI laboratory for consistency with ASTM D2488 (Classification of Soils for Engineering Purposes).

3.4 Test Pit Program

The test pit program consisted of 13 test pits excavated by Guild Drilling Co. of East Providence, RI on September 21 and 22, 1987. The depths and elevations of the test pits are summarized in Table 2. The locations of the test pits are shown in Fig. 2.

The excavation of the test pits was observed full time by a GEI field representative. Personnel from NED-USCE were present

to take composite soil samples from selected test pits for environmental testing. Test pit logs prepared by GEI are contained in Appendix B

3.5 Summary of Subsurface Conditions

The subsurface conditions at the site vary significantly onshore and offshore. Borings performed offshore generally encountered organic clay overlying sands, and borings and test pits onshore generally encountered fill overlying sands. The subsurface conditions are described below for the onshore and offshore portions on the site.

Onshore Portion of Site

Descriptions of the individual soil strata starting from ground surface downwards are given below:

FILL - Between about 3 and 8 feet of fill was encountered in the onshore borings and test pits. The fill generally consists of building debris including bricks, ash, cinders, metal and wood. Apparently the old mill buildings at the site were demolished and the debris was buried in the basements. There is soil fill covering the building debris and outside of the foundations. Grain-size curves for two samples of the onshore granular fill are shown in Fig. 5.

ORGANIC CLAY - A layer of organic clay was encountered in one boring (PD20) beneath the fill. The organic clay contained shells and was sandy in the upper portion of the layer. The organic clay was about 14.5 feet thick at PD20. The Standard Penetration Test (SPT) N-values ranged from 3 to 7.

SANDS - All of the onshore borings encountered natural sands beneath the fill. Two test pits (TP 2 and 9) appear to have encountered the natural sands beneath the fill. The sands vary from a silty sand (SM) with about 20% non-plastic fines to clean narrowly graded sands (SP). The entire thickness of the sand stratum was penetrated in only one boring (PD23), and was about 29 feet thick at this location. The SPT N-values ranged from 3 to 63, with a typical value of about 20.

Bedrock was cored in only one boring, PD23. The rock core consisted of a mica gneiss. Groundwater appears to be about 3 to 7 feet below ground surface based on measurements made in the borings and test pits. Groundwater elevations may be different at the time of construction.

Offshore Portion of Site

Descriptions of the individual soil strata starting from the mudline downwards are given below:

ORGANIC CLAY - A layer of organic clay with sand (OH) was encountered in all 10 offshore borings. The organic clay contains about 20 to 30% fine to medium sand by weight and occasional shells and organic matter. The organic clay has a high plasticity. The thickness of the layer ranged from 5.5 to 17.0 feet at the boring locations, with an average thickness of about 14 feet. Field Vane Shear Tests indicated a range in peak undrained shear strengths from about 50 to 370 psf. Grain-size curves for two samples of organic clay are shown in Fig. 4.

SANDS - The sands encountered offshore were similar to the sands encountered in the onshore borings and test pits. The SPT N-values ranged from 5 to 46 with a typical value of about 10 to 15. The entire thickness of the sand statum was not penetrated in any of the offshore borings.

Bedrock was not encountered in any of the offshore borings.

4. LABORATORY

4.1 General

Laboratory tests were performed on selected undisturbed samples of the organic clay and on two samples of the onshore granular fill. Due to the known presence of PCB's in the organic clay a health and safety plan was followed. The health and safety plan consisted of the following procedures:

1) All laboratory personnel directly exposed to samples of organic clay wore protective gloves.

2) All equipment exposed to the organic silt was washed with soap and water after use and the wash water collected in a 55-gallon drum. All disposable supplies exposed to the organic silt were placed in a 55 gallon drum. The drums were disposed of by NED-USCE.

3) To avoid volatilizing the PCB's, the temperature of ovens used to dry the organic silt for the various tests was limited to about 40 C to 50 C except when the oven exhaust was vented into a fan-operated draft hood vented directly to the exterior of the building.

4.2 Index Tests

Atterberg Limits and water contents were determined on selected samples of organic clay. The tests were performed according to ASTM procedure D2216 and D4318 with one exception. As discussed above, to minimize the volatilization of PCB's in the samples the oven temperature was about 40 to 50 C instead of the 110 C specified by ASTM. We evaluated the effect of a lower temperature oven by checking the weight of samples of the organic clay at different lengths of drying time and by checking the water content of a sample of clay (not from this site) in both the lower temperature oven and the 110 C oven. Based on the results of these comparisons we estimate that the water contents measured using a lower temperature oven are approximately the same as those measured in a higher temperature oven for this project. The results of the tests are summarized in Table 5. A plasticity chart is shown in Fig. 3.

It should be noted that the liquid limits reported in Table 5 are significantly higher than results of tests performed for earlier studies at this site [1]. We suspect that the soil may have been air or oven dried prior to performing the Atterberg

limits in the earlier studies. All tests performed by GEI for this project were on non-dried soil in accordance with ASTM procedures. To investigate the differences in results we performed limits on two samples of oven-dried soil. The results were as follows:

	Liquid Limit	
Sample	Non-oven-dried	Oven-dried
PD34A/UO2	116	71
PD34/U5	103	58

The higher liquid limits measured by GEI result in a soil classification of Organic Clay (OH) rather than Organic Silt (OH) as was previously reported [1].

Three specific-gravity tests were performed on samples of the organic clay. The tests were performed according to ASTM D854. The results are summarized in Table 5.

Four grain-size analyses were performed, two on the organic clay and two on the onshore granular fill. The tests were performed according to ASTM D421 and D422. The results are shown in Figs. 4 and 5.

4.3 One-Dimensional Consolidation Tests

Two one-dimensional consolidation tests were performed on the organic clay. The compression curves for these tests are shown in Figs. C1 and C2 in Appendix C. The results are presented in terms of percent strain vs log of vertical effective stress. The results are based on the percent strain at 480 minutes after application of each load. The strain at 480 minutes was selected as a convenient time beyond the end of primary consolidation. The virgin compression ratio, CR, was 0.464 % strain per log cycle of stress for test C1 and 0.243 for test C2.

Plots of C_v (Coefficient of Consolidation) vs log of vertical effective stress are shown in Fig. C3 for the two tests. C_v was estimated using square root of time consolidation curves. Values of C_α (Coefficient of Secondary Compression) are shown in Figs. C1 and C2 for selected stresses. C_α ranged from 0.57 to 1.42 % strain per log cycle of time.

4.4 Unconsolidated-Undrained Triaxial Q Tests

Four unconsolidated-undrained triaxial Q tests were performed on samples of the organic clay. The tests were performed according to U.S. Army Corps of Engineers EM 1110-2-1906. The tests were performed using a cell pressure of 410 psf. This cell pressure is approximately the lowest pressure which could be maintained constant. The estimated in-situ effective vertical stress for the undisturbed samples tested was about 100 to 200 psf. The results of the tests are summarized in Table 5 and in Figs. C4 through C7. The peak deviator stress ranged from 98 to 519 psf.

4.5 Consolidated-Undrained Triaxial $\bar{R}$ Tests

Two consolidated-undrained triaxial $\bar{R}$ tests were performed on samples of the organic clay. The tests were performed according to U.S. Army Corps of Engineers EM 1110-2-1906. Test R1 was consolidated to an effective stress equal to the estimated vertical stress beneath the full height of the proposed dike. Test R2 was consolidated to an effective stress equal to the estimated vertical effective stress beneath the midslope of the proposed dike. The results are summarized in Table 5 and in Figs C8 through C11 in Appendix C. The peak undrained shear stress was 407 psf in R1 and 298 psf in R2.

LIST OF REFERENCES

[1] Woodward Clyde Consultants, "Summary of Laboratory Test Data - New Bedford Superfund Site," pages F-1 to 6 and G-1 to 3, Oct. 1986.

TABLE 1 - SUMMARY OF BORINGS
New Bedford Superfund Site

Boring No.	Location	Ground Surface Elevation (1) (ft)	Total Depth (ft)	Bottom Elevation (1) (ft)
PD20	Land	11.0	26.0	-15.0
PD21	Land	11.9	4.0	7.9
PD21A	Land	11.9	26.0	-14.1
PD22	Land	12.0	41.0	-29.0
PD23	Land	9.3	39.3	-30.0
PD24	Land	8.2	40.0	-31.8
PD25	Water	-2.2	22.0	-24.2
PD26	Water	-1.2	22.0	-23.2
PD27	Water	-0.9	32.0	-32.9
PD28	Water	-0.5	17.0	-17.5
PD29	Water	-1.2	32.0	-33.2
PD30	Water	-1.7	17.0	-18.7
PD31	Water	-2.1	17.0	-19.1
PD32	Water	-2.1	22.0	-24.1
PD33	Water	-1.4	22.0	-23.4
PD34	Water	-0.6	17.0	-17.6
PD34A	Water	-0.4	8.5	-8.9

Note:

1) Mean Low Water (MLW) datum

TABLE 2 - SUMMARY OF TEST PITS
New Bedford Superfund Site

Test Pit No.	Ground Surface Elevation[1] (ft)	Total Depth (ft)	Bottom Elevation[1] (ft)
TP1	8.0	4.0	4.0
TP2	10.8	6.0	4.8
TP3	8.7	6.5	2.2
TP4	8.4	6.0	2.4
TP5	8.4	7.0	1.4
TP6	8.4	7.5	0.9
TP7	8.8	6.5	2.3
TP8	9.0	4.2	4.8
TP9	9.0	7.0	2.0
TP10	11.9	6.3	5.6
TP11	8.0	7.0	1.0
TP12	9.8	4.0	5.8
TP13	8.7	4.6	4.1

Note:

1) Mean Low Water (MLW) datum

TABLE 3 - SUMMARY OF TUBE SAMPLES
New Bedford Superfund Site

Boring No.	Sample No.(1)	Depth (ft)	Penetration (ft)	Recovery (ft)	Elevation(2) Top (ft)	Elevation(2) Bottom (ft)
PD27	UO1	5.5	2.0	2.0	-6.4	-8.4
	UO2	8.0	2.0	2.0	- 8.9	-10.9
	UO3	10.5	2.0	2.0	-11.4	-13.4
	UO4	13.0	2.0	2.0	-13.9	-15.9
PD29	UO1	5.0	1.9	1.9	-6.2	-8.1
	UO2	7.5	2.0	2.0	-8.7	-10.7
	UO3	10.0	2.0	2.0	-11.2	-13.2
	UO4	12.5	2.0	2.0	-13.7	-15.7
PD30	UO1	4.5	2.0	2.0	-6.2	-8.2
PD34A	UO1	4.0	2.0	2.0	-4.4	-6.4
	UO2	6.5	2.0	2.0	-6.9	-8.9
PD34	U1	5.0	2.0	0.0	-5.6	-7.6
	U2	7.0	2.0	0.7	-7.6	-9.6
	U3	10.0	2.0	1.9	-10.6	-12.6
	U4	12.5	2.0	0.8	-13.1	-15.1
	U5	15.0	2.0	1.9	-15.6	-17.6

Note:

(1) UO - Osterberg (Gus) sampler
U - Shelby sampler

(2) Mean Low Water (MLW) datum

TABLE 4 SUMMARY OF FIELD VANE TESTS
New Bedford Superfund Site

Boring	Vane Test No.	Depth to Top of Vane ft	Elev. Top of Vane ft	Peak Torque in-lb	Peak Shear Strength(2) psf	Steady State Torque in-lb	Steady State Strength(2) psf
PD25	V1	1.0	-3.2	140	86	20	12
	V2	2.8	-5.0	210	129	30	18
	V3	4.6	-6.8	190	117	25	15
	V4	6.4	-8.6	280	172	40	25
	V5	8.2	-10.4	260	160	20	12
	V6	10.0	-12.2	280	172	15	9
	V7	11.8	-14.0	300	184	30	18
	V8	13.6	-15.8	>600	NA	-	-
PD26	V1	1.0	-2.2	80	49	5	3
	V2	2.8	-4.0	160	98	25	15
	V3	4.6	-5.8	225	138	35	21
	V4	6.4	-7.6	160	98	25	15
	V5	8.2	-9.4	300	184	15	9
	V6	10.0	-11.2	510	313	35	21
	V7	11.8	-13.0	600	368	25	15
	V8	13.6	-14.8	>600	NA	-	-
PD27	V1	1.0	-1.9	155	95	15	9
	V2	2.8	-3.7	140	86	30	18
	V3	4.6	-5.5	210	129	40	25
PD28	V1	1.0	-1.5	180	110	30	18
	V2	2.8	-3.3	180	110	35	21
	V3	4.6	-5.1	145	89	30	18
	V4	6.4	-6.9	325	199	30	18
	V5	8.2	-8.7	310	190	40	25
	V6	10.0	-10.5	470	288	35	21
	V7	11.8	-12.3	410	252	120	74
PD29	V1	1.0	-2.2	170	104	40	25
	V2	2.8	-4.0	220	135	40	25
PD30	V1	1.0	-2.7	150	92	25	15
	V2	2.8	-4.5	300	184	45	28
PD31	V1	1.0	-3.1	110	68	20	12
	V2	2.8	-4.9	160	98	30	18
	V3	4.6	-6.7	320	196	50	31
	V4	6.4	-8.5	295	181	30	18
	V5	8.2	-10.3	215	132	20	12
	V6	10.0	-12.1	365	224	40	25
	V7	11.8	-13.9	>600	NA	-	-
	V8	13.6	-15.7	>600	NA	-	-

Notes: see page 2

TABLE 4 SUMMARY OF FIELD VANE TESTS
New Bedford Superfund Site

Boring	Vane Test No.	Depth to Top of Vane ft	Elev. Top of Vane ft	Peak Torque in-lb	Peak Shear Strength(2) psf	Steady State Torque in-lb	Steady State Strength(2) psf
PD32	V1	1.0	-3.1	100	61	10	6
	V2	2.8	-4.9	160	98	25	15
	V3	4.6	-6.7	150	92	35	21
	V4	6.2	-8.3	430	264	50	31
	V5	8.0	-10.1	285	175	60	37
	V6	9.8	-11.9	260	160	50	31
	V7	11.6	-13.7	>600	-	-	-
PD33	V1	0.6	-2.0	130	80	30	18
	V2	2.4	-3.8	420	258	18	11
	V3	3.2	-4.6	278	171	80	49
	V4	4.2	-5.6	320	196	40	25
	V5	6.0	-7.4	410	252	60	37
	V6	6.8	-8.2	540	331	80	49
PD34	V1	1.0	-1.6	100	61	30	18
	V2	2.8	-3.4	397	244	30	18

Notes:

(1) Mean Low Water (MLW) datum.

(2) Vane tests performed using 4-inch-diameter by 8-inch-long vane rotated by hand. Torque was corrected by dividing by the ASTM D2773 shape factor, k (=0.136) and converting from psi to psf to obtain the shear strength.

TABLE 5 SUMMARY OF LABORATORY TESTS
New Bedford Superfund Site

Boring	Sample	Depth ft.	Natural w %	LL	PL	PI	Class-ification	Specific Gravity	Grain Size Fig.	Consolidation Test Fig. No.	eo	wo %	CR	Q Test Fig. No.	Water Content %	Peak Deviator Stress psf	$\bar{R}$ Test Fig. No.	Effective Consol-idation Stress psf	Water Content after Consol-idation %	Peak Shear Stress psf
PD27	U01	5.5-7.5	128	122	35	87	OH							C4	128	120				
PD27	U02	8.0-10.0	103	104	33	71	OH							C7	103	233				
PD27	U04	13.0-15.0	120				OH													
PD29	U02	7.5-9.5	92	83	25	58	OH		4					C6	92	105	C9	614	66	298
PD34A	U01	4.0-6.0	120				OH													
PD34A	U02	6.5-8.5	99	116	35	81	OH	2.59		C1	3.048	118.0	0.464							
PD34	U3	10.0-12.0	91	106	33	73	OH	2.66									C8	1434	57	407
PD34	U5	15.0-17.0	88	103	36	67	OH	2.56	4	C2	2.321	90.0	0.243	C5	86	519				
TP3	S1	4.0					SM		5											
TP4	S1	3.5					SM		5											

Source : New Bedford North Quadrangle
Scale : 1 inch = 2000 - feet

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	SITE LOCATION PLAN
GEI Winchester, Massachusetts	Project 87311	Nov. 13, 1987 Fig. 1

CORPS OF ENGINEERS — U. S. ARMY

A B C D E F G H

757500E 758000E 758500E

241000N 240500N

BELLEVILLE AVE.

PAVED

GRAVEL

GRAVEL

GRAVEL

RAMP

PAVED

SOCCER FIELD

PAVED

SAWYER STREET

PAVED

COMBINED SEWER

RAMP

CONC. FND.

CONC. FND.

PROPOSED SHEET PILE WALL

℄ OF PROPOSED CONFINED DISPOSAL FACILITY

MEAN LOW WATER LINE

TOE OF PROPOSED DIKE

ACUSHNET RIVER

FLOOD

EBB.

N

TP1 EL. 6.0
TP2 EL. 10.8
TP3 EL. 8.7
TP4 EL. 8.4
TP5 EL. 8.5
TP6 EL. 8.4
TP7 EL. 8.9
TP8 EL. 8.7
TP9 EL. 11.0
TP10 EL. 12.0
TP11 EL. 10.0
TP12 EL. 9.8

PD20 EL. 11.0
PD21 EL. 11.9
PD21A EL. 11.9
PD22 EL. 12.0
PD23 EL. 9.3
PD24 EL. 8.2
PD25 EL. -2.2
PD26 EL. -1.2
PD27 EL. -0.9
PD28 EL. -0.5
PD29 EL. -1.2
PD30 EL. -1.7
PD31 EL. -2.1
PD32 EL. -2.1
PD33 EL. -1.4
PD34, 34A EL. -0.5

SITE PLAN

SCALE: 1" = 50'

NOTES

1. BASE PLAN PROVIDED BY NED-USCE.
2. BORING AND TEST PIT LOCATIONS WERE DETERMINED USING BASELINES ESTABLISHED IN THE FIELD BY GEI USING NED-USCE CONTROL POINTS. LOCATIONS OF WATER BORING ARE WITHIN 5 FEET HORIZONTALLY OF THE LOCATIONS SHOWN ON THIS PLAN.
3. GROUND SURFACE ELEVATION (TOP OF MUD FOR WATER BORINGS) AT THE BORING AND TEST PIT LOCATIONS MEASURED BY GEI. BENCHMARK IS NED-USCE DISK K LOCATED ON MOST NORTHERLY EDGE OF CONCRETE SIDEWALK ON THE NORTH SIDE OF THE COGGESHALL ST. BRIDGE, ELEVATION 20.36 FEET MLW.
4. CONTOUR INTERVAL = 1 FOOT

GRAPHIC SCALES

1"=50' 50 0 50 100

LEGEND

PD23 EL. 8.2 BORING
TP1 EL. 8.4 TEST PIT
GROUND SURFACE ELEVATION MLW DATUM

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.R.	R.F.E.	

SUBMITTED:
CHIEF SECTION
APPROVAL RECOMMENDED:
CHIEF, DESIGN BRANCH
REVIEWED:
PROJECT MANAGER
APPROVAL RECOMMENDED:
CHIEF, PROJECT MGT. BRANCH

SUPERFUND PILOT STUDY
NEW BEDFORD HARBOR, MASS.
CONFINED DISPOSAL FACILITY
SITE PLAN

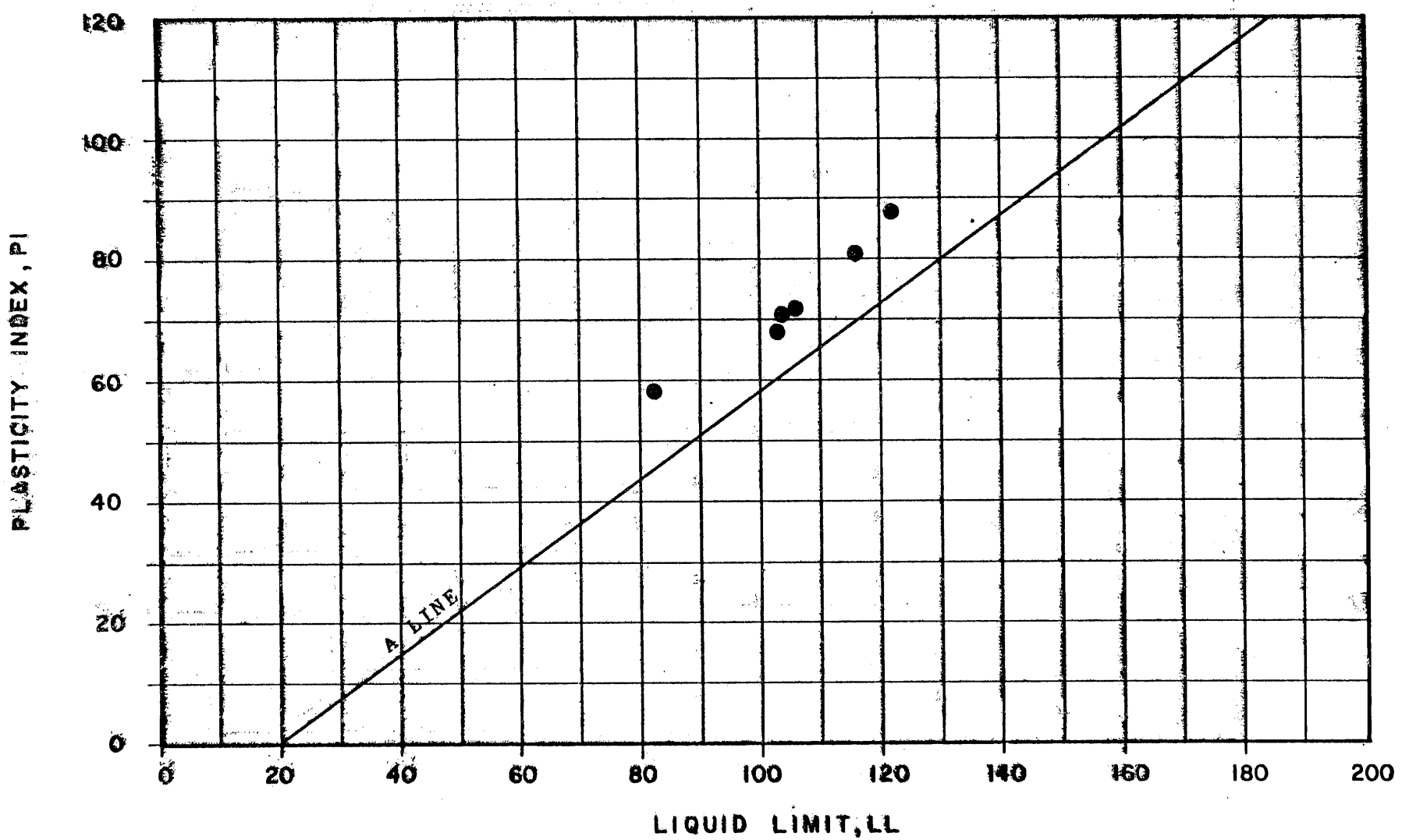
APPROVED
CHIEF, ENGINEERING DIVISION
DATE AUG. 1987

GEOTECHNICAL ENGINEERING INC.
WINCHESTER, MASSACHUSETTS

SCALE AS SHOWN SPEC. NO.
DRAWING NUMBER N.B. 341
SHEET 1 OF 9

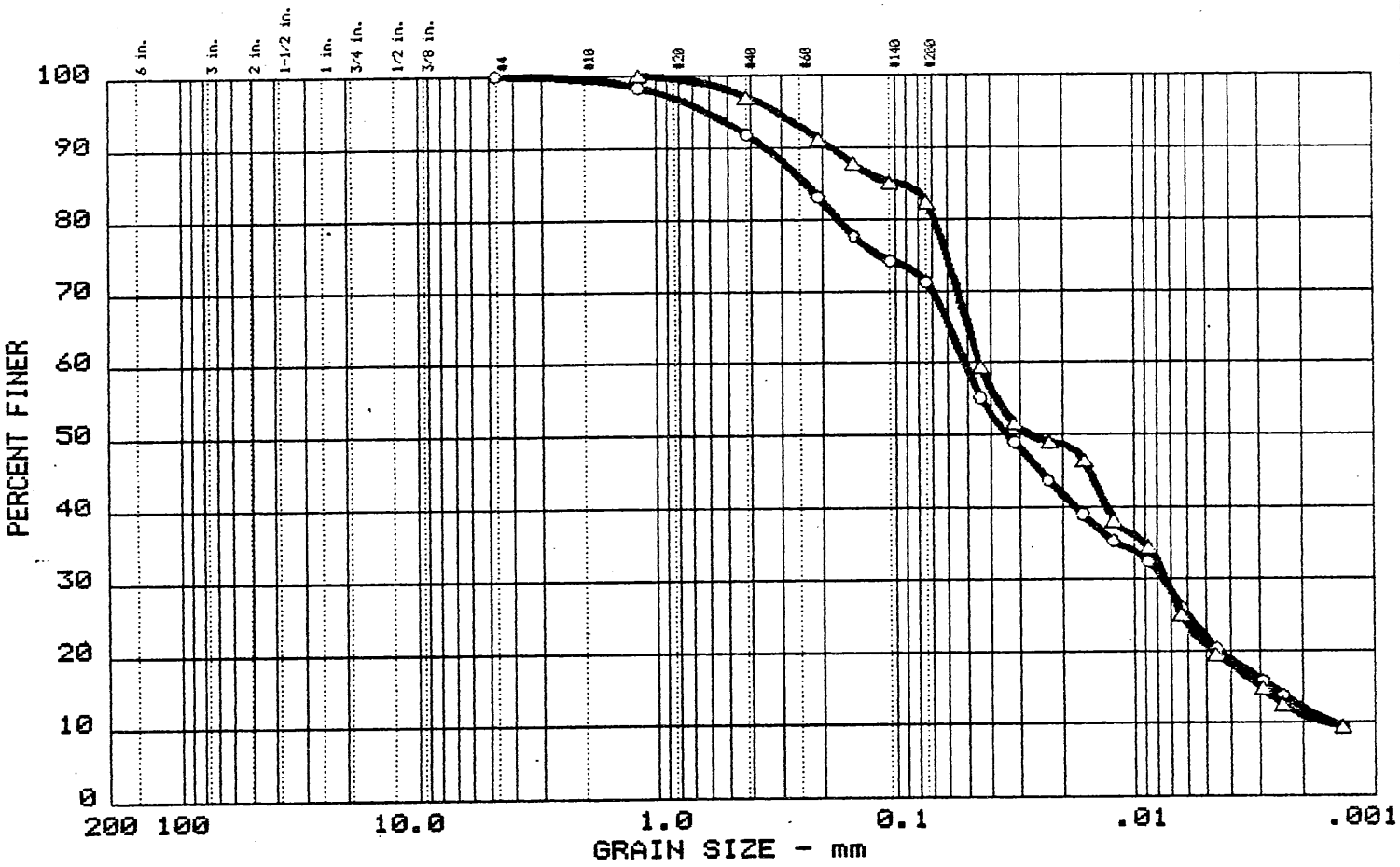
PROJECT 87511 NOVEMBER 13, 1987

FIG. 2



US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	PLASTICITY CHART ORGANIC CLAY
GEI Winchester, Massachusetts	Project 87311	Nov. 13, 1987 Fig. 3

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% FINES
○	0.0	0.0	28.8	71.2
△	0.0	0.0	17.6	82.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	83	58	0.23		0.03	0.008	0.0027	0.0015	0.74	33.9
△	105	67	0.09		0.03	0.007	0.0030	0.0016	0.76	27.5

MATERIAL DESCRIPTION	USCS	AASHTO
○ Organic clay	OH	
△ Organic clay	OH	

Project No.: 87311
Project: New Bedford Superfund
○ Location: PD-29, UO-2
△ Location: PD-34, U-5

Date: November 13, 1987

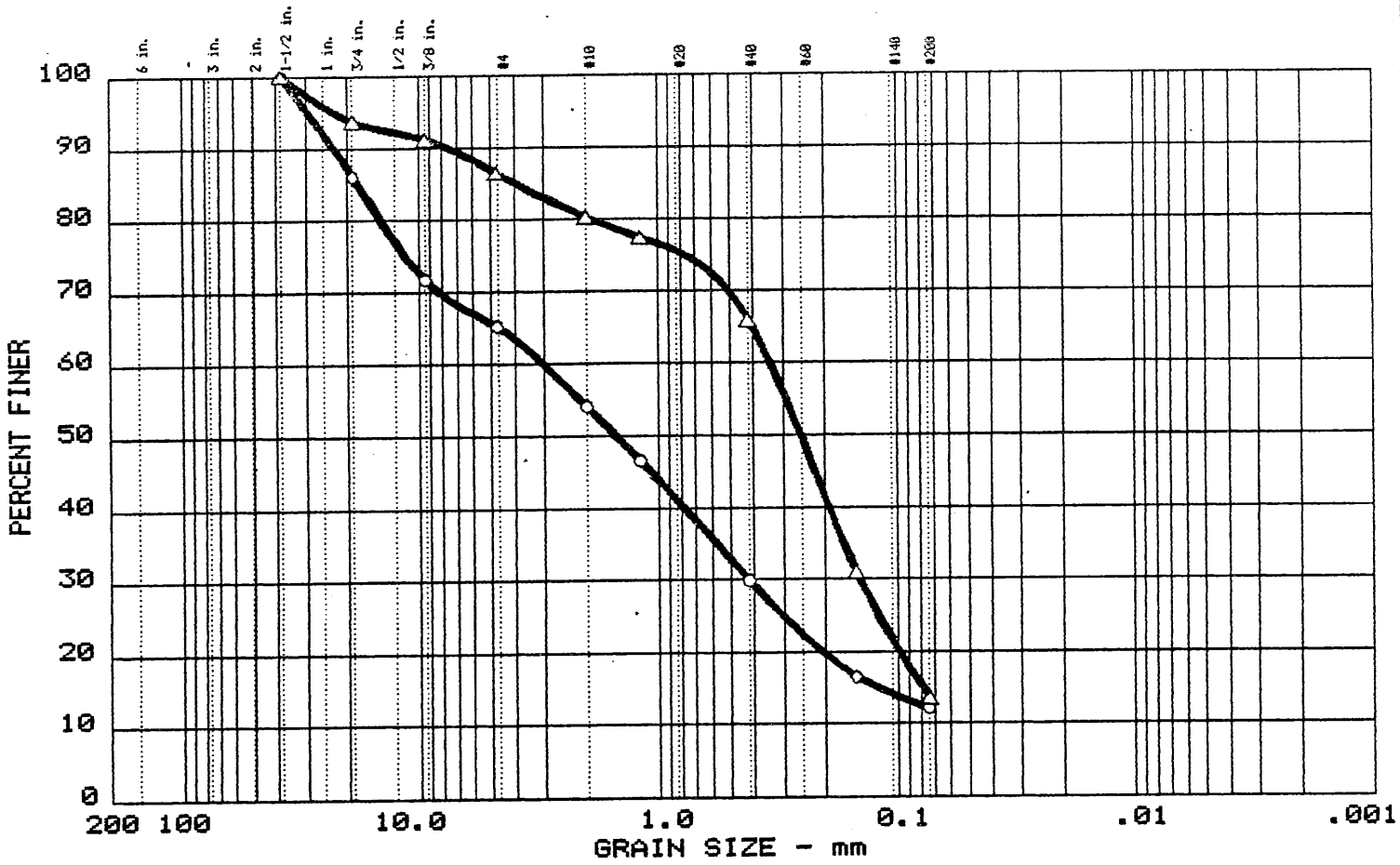
GRAIN SIZE CURVES
ORGANIC CLAY

GRAIN SIZE DISTRIBUTION TEST REPORT

GEOTECHNICAL ENGINEERS, INC.

Fig. No. 4

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% FINES
○	0.0	34.8	53.0	12.2
△	0.0	13.5	72.8	13.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			18.20	3.02	1.50	0.422	0.1216			
△			3.89	0.34	0.25	0.144	0.0783			

MATERIAL DESCRIPTION	USCS	AASHTO
○ Silty sand with gravel	SM	
△ Silty sand with gravel	SM	

Project No.: 87311
Project: New Bedford Superfund
○ Location: TP-3
△ Location: TP-4

Date: November 13, 1987

GRAIN SIZE DISTRIBUTION TEST REPORT

GEOTECHNICAL ENGINEERS, INC.

GRAIN SIZE CURVES
ONSHORE FILL

Fig. No. 5

APPENDIX A

BORING LOGS

BORING LOCATION See Fig. 2 DATE START/FINISH 17 Sept 1987 / 18 Sept 1987 | PD-20

GROUND ELEVATION (MLW) 11.0 ft. DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 3.0 ft. DATE 17 Sept87 LOGGED BY T. May, GEI TOTAL DEPTH (FT) 26.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
10	0	S1	1-3-7-15	24	18			S1: Silty Sand with gravel. Fine to Coarse sand fine to coarse gravel, nonplastic fines, cinders, dark brown to black, dry. (FILL).
		S2	18-16-18-26	24	24	HW Casing	FILL	S2: Silty Sand with gravel. Fine to coarse sand, fine to coarse gravel, silt, blue gray, dry, and brick fragments. (FILL).
5	5	S3	27-15-8-11	24	18	NW Casing Wash Boring		S3: Silty Sand. Widely graded fine to coarse sand with about 30% fines; cinders, and coal, black, dry. (FILL).
		S4	6-8-8-9	24	8			S4: Similar to S3 but with fine gravel and metal. (FILL).
0	10	S5	1-1-2-1	24	12		ORGANIC CLAY	S5: Organic Clay. Organic clay with fine sand, occ. coarse sand to fine gravel, saturated, organic odor, dark gray. (OH).
	15	S6	4-2-2-3	24	24			S6: Organic Clay. Organic clay with trace of sand, organic odor, dark gray. (OH).
-5	20	S7	6-4-3-8	24	8			S7: Organic clay. Organic clay with shells, organic odor, dark gray. (OH).
-10						Change in wash returns. Bottom of Casing		
	25	S8	50/4"-4*/2"-7*-6*-5*	24	20	*300# hammer	SILSTAND	S8: Silty Sand. Fine to medium sand with 20% fines, golden orange brown. (SM).
								BOTTOM OF BORING 26.0 FEET.

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 15 Sept 1987/ 15 Sept 1987

GROUND ELEVATION (MLW) 11.9 ft. DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Not Observed DATE 15 Sept87 LOGGED BY T. May, GEI TOTAL DEPTH (FT) 4.0

PD-21

PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS	SOIL AND ROCK DESCRIPTIONS
10		S1	3-8-7-9	24	10	10 ppm VOC in borehole(1)	S1: Silty Sand. Fine to medium sand with fine gravel, organic silt, glass, dark brown, dry. (FILL).
		S2	3-5-7-11	24	8	15 ppm VOC in borehole(1)	S2: Silty Sand. Widely graded fine to coarse sand with gravel and silt, chips of coal,oily odor. (FILL).
							BOTTOM OF BORING 4.0 FEET.

5 10 0 15 -5 20 -10 25 -15

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON
UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1)Volatile organic compounds meas. using HNU photoionization detector.
2) Boring terminated due to elevated VOC in borehole.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 18 Sept 1987 / 18 Sept 1987 | PD-21A

GROUND ELEVATION (MLW) 11.9 ft. DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 7 ft DATE 20 min(1) LOGGED BY T. May, GEI TOTAL DEPTH (FT) 26.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
10	0	S1	3-6-4-2	24	12	Ambient HNU readings	FILL	S1: Silty Sand. Widely graded fine to coarse sand and gravel with silt, glass, slag, cinders, and coal. (FILL).
		S2	3-16-11-10	24	2	Wash Boring Using NW Casing		S2: Silty Sand. Widely graded sand with nonplastic fines, slag, cinders, and glass. (FILL).
	5	S3	26-24-17-17	24	6			S3: Sand. Fine sand with brick fragments, light brown (FILL).
5		S4	13-11-14-16	24	24		SANDS	S4: Narrowly Graded Sand. Fine sand with <5% fines, light brown, dry. (SP).
		S5	10-13-17-16	24	20			S5: Narrowly Graded Sand with silt. Fine sand with about 10% fines, light brown. (SP-SM).
	10							
0								
	15	S6	4-6-9-7	24	12			S6: Similar to S5.
-5								
	20	S7	7-7-13-14	24	18			S7: Silty Sand. Narrowly graded fine sand with 10-20% nonplastic fines, stratified, light brown. (SP-SM).
-10						Bottom of Casing		
	25	S8	10-12-9-12	24	12		SW	S8: Sand. 0-6" Narrowly graded fine sand. (SP). 6-12" Widely graded fine to coarse sand with gravel. (SW).
-15								BOTTOM OF BORING 26.0 FEET.

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1) Measured about 20 min. after completion of boring.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 14 Sept 1987 / 15 Sept 1987 | PD-22

GROUND ELEVATION (MLW) 12.0 ft. | DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 6 ft. | DATE 15 Sept87 | LOGGED BY M.Mahoney/T.MayGEI | TOTAL DEPTH (FT) 41.0 | PG. 1 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
10		S1	2-8-10-12	24	12	Hollow Stem Augers	FILL	S1: Silty Sand. Widely graded sand, low plasticity fines, leather scraps, <5% gravel, brown. (FILL).
		S2	10-100/5"	10	8	Augers bounced while advancing 2.8'-4.0'.		S2: Leather scraps, ashes, glass, debris, etc., <5% soil. (FILL)
						Auger cuttings include leather scraps.		
	5	S3	14-9-24-16	24	20			S3: Narrowly Graded Sand, fine sand, 30-40% brick fragments, gold-brown. (FILL).
5		S4	3-4-6-6	24	16	Approximate Stratum change		S4: Narrowly Graded Sand, fine sand, 5% ash, gold-brown. (FILL).
		S5	4-10-18-26	24	12			S5: Narrowly Graded Sand. Stratified by color into <1 inch layers, gold-brown. (SP).
	10					Auger cuttings 10-15' narrowly graded sand, saturated.		
0								
	15	S6	4-10-7-10	24	13		SANDS	S6: Widely Graded Sand. Fine to medium sand, stratified by color and particle size into <1 inch layers, <5% fines, occasional fine gravel, light brown to gray. (SW).
-5						Auger cuttings 17'-20' Widely graded sand, saturated.		
	20	S7	3-6-9-10	24	20			S7: Similar to S6.
-10						Advanced augers to 24' NW casing from 24'-39'.		
	25	S8	13-8-8-10	24	13	Wash Boring Using NW Casing		S8: Widely Graded Sand. Fine to coarse sand, <5% fines, light brown. (SW).
-15						Wash returns fine to medium sand.		
		S9	4-5-5-9	24	10			S9: Similar to S8.

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATE

NOTES:

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 14 Sept 1987 / 15 Sept 1987

GROUND ELEVATION (MLW) 12.0 ft DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 6.0 ft. DATE 15 Sept87 LOGGED BY M.Mahoney/T.MayGEI TOTAL DEPTH (FT) 41.0

PD-22

PG. 2 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
-20		S9	4-5-5-9	24	0	Sand running into casing sample taken for soil classification. Wash returns Med. to coarse sand, gravel in casing.		
	35	S10	10-10-4-12	24	22		SANDS	S10A: 0-12" Sand. Predominantly fine to medium sand, <5% fines, light brown. (SP). S10: 12-22" Sand. Medium to coarse sand, <5% fines, <5% fine gravel, light brown. (SP).
-25						Wash Boring Using NW Casing Bottom of casing		
	40	S11	21-16-47-33	24	14			S11: Silty Sand. Fine sand with fine to medium gravel 20-30% fines, light brown. (SM).
	45							BOTTOM OF BORING 41.0 FEET.

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:

NEW BEDFORB SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 16 Sept 1987 / 16 Sept 1987 | PD-23

GROUND ELEVATION (MLW) 9.3 ft. | DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 3.0 ft DATE 20 min(1) | LOGGED BY T. May, GEI | TOTAL DEPTH (FT) 39.3 | PG. 1 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
		S1	3-39-20-3	24	18	Driving on solid object.	FILL	S1: 0-4" Sandy Organic. TOPSOIL 4-18" Brick fragments and Sand. Fine to medium sand light brown, dry. (FILL).
		S2	6-12-11-10/5"-20/0"	23	6	Wash Boring Using NW Casing Wash returns:		S2: Brick Fragments and Mortar. (FILL).
5	5					Brick & mortar Roller bit ahead Fine sand		
		S3	7-13-20-21	24	24	NW Casing Samples wet	SILTY SANDS	S3: Silty Sand. Narrowly graded fine sand with 10-15% fines, light tan saturated. (SP-SM).
0	10	S4	10-13-14-16	24	20			S4: Silty Sand. Narrowly graded fine sand with 30% fines, light tan. (SM).
-5	15	S5	8-10-10-10	24	24			S5: Silty Sand to Sandy Silt. Very fine sand, ≥50% nonplastic fines, light gray to tan. (SM-ML).
-10	20	S6	4-7-12-13	24	24		STRATIFIED SANDS	S6: Narrowly Graded Sand. Fine to medium sand, <5% fines, light brown. (SP).
-15	25	S7	2-6-9-10	24	10			S7: Similar to S6: with occasional coarse grains and gravel.
-20		S8	10-13-21	24	10			S8: Silty Sand. Widely graded fine to coarse sand with ≥20% fines, 10-15% gravel, golden brown, till structure. (SM).

13

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1) Measured about 20 min. after completion of boring.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 16 Sept 1987 / 16 Sept 1987 PD-23

GROUND ELEVATION (MLW) 9.3 ft. DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 3.0 ft DATE 20 min(1) LOGGED BY T. May, GEI TOTAL DEPTH (FT) 39.3 PG. 2 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
		S8	10-13-21 13	24	8	Wash Boring Using NW Casing	SANDS	Silty Sand continued.
-25		S9	40*/3"	3	3	* 300# hammer		S9: Silty Sand. Widely graded fine to coarse sand with ~20% fines, golden brown. (SM).
	35	RUN 1	min/ft 5 4 5 5 5	60	56	NW Rock Core RQD 83%	GRANITE	RUN 1: Mica Gneiss. Pinkish gray with mineralized discontinuities dipping at approx. 80 degrees.
-30								
	40							BOTTOM DEPTH 39.3 FEET.
-35								
	45							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1) Measured about 20 min. after completion of boring.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 17 Sept 1987 / 17 Sept 1987 | PD-24

GROUND ELEVATION (MLW) 8.2 feet | DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 4.0 ft DATE 20 min(2) | LOGGED BY T. May, GEI | TOTAL DEPTH (FT) 40.0 | PG. 1 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
5	5	S1	6-7-6-11	24	18	3ppm VOC in borehole(1)	FILL	S1: 0-3" Brick Fragments. 3-18" Silty Sand. Widely graded fine to coarse sand contains cinders and coal, black. (FILL).
		S2	8-6-11-12	24	16	Wash boring using HW casing		S2: Cinders and Slag. (FILL).
		S3	3-2-2-3	24	18			S3: Similar to S2, saturated. (FILL).
0		S4	5-4-3-4	24	10	NW casing		S4: 0-5" Cinders in Silty Sand. (FILL). S4A: 5-10" Silty Sand. Narrowly graded fine sand with about 35% fines, dark gray, saturated. (SM).
	10	S5	4-4-3-3	24	12		ORGANIC SM ?? SILTY SAND	S5: Silty Sand. Narrowly graded fine sand with about 30 to 40% organic silt, gray to orange brown. (SM with OL)
-5						Approximate boundary between Org. SM and SM		
	15	S6	16-11-8-13	24	18			S6: Silty Sand. Narrowly graded fine sand with about 10 to 20% non-plastic fines. Occ. coarse sand and fine gravel. (SM)
-10								
	20	S7	11-17-23-24	24	24		STRATIFIED SANDS	S7: 0-20" Silty Sand to Silt. Narrowly graded fine sand with about 30% fines (nonplastic silt), light gray. (SM-ML). 20-24" Narrowly Graded Sand. Medium sand with about 5% fines, brown. (SP)
-15								
	25	S8	7-11-13-13	24	24			S8A:0-18" Narrowly Graded Sand. Medium to coarse sand with <5% fines, brown. (SP) S8: 18-24" Silty Sand. Narrowly graded fine sand with about 10-20% fines, brown. (SP-SM)
-20								
		S9	3-6-8-13	24	24			S9: Narrowly Graded Sand. Fine to medium sand with < 5% fines, light brown. (SP-SW)

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1)Volatile organic compounds meas. using HNu photoionization detector.
2)Measured about 20 min. after completion of boring.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 17 Sept 1987 / 17 Sept 1987 PD-24

GROUND ELEVATION (MLW) 8.2 ft. DRILLED BY P. Didden, Guild Drilling

GROUNDWATER EL. Depth 4 ft. DATE 20 min(2) LOGGED BY T. May, GEI TOTAL DEPTH (FT) 40.0 PG. 2 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
		S9	3-6-8-13	24	24	Wash Boring Using NW Casing	WIDELY GRADED SAND	S9: Narrowly Graded Sand. Fine sand with <5% fines, brown. (SP). Widely Graded Sand. Fine to coarse sand with <5% fines, brown, in shoe of sampler. (SW).
-25								
	35	S10	5-5-5-8	24	4			S10: Widely Graded Sand. Fine to coarse sand with <5% fines, brown. (SW).
-30								
		S11	100-50*	12	0	*300# hammer		S11: Widely Graded Sand. Medium to coarse with <5% fines, ~5% gravel, gray brown. (SW). See note 1
	40					Driller says pushing a cobble.		BOTTOM OF BORING 40 FEET.
	45							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1) Split spoon sample S11 maybe wash material.
2) Measured about 20 min. after completion of boring.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 25 Sept 1987 / 28 Sept 1987 | PD-25

GROUND ELEVATION (MLW) -2.2 ft DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A DATE _____ LOGGED BY M. Mahoney, GEI TOTAL DEPTH (FT) 22.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing for vane tests. Wash boring using NW casing after vane tests.		FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED — PEAK — RESIDUAL 1.0-1.8′ — 140 — 20 2.8-3.6′ — 210 — 30 4.6-5.4′ — 190 — 25 6.4-7.2′ — 280 — 40 8.2-9.0′ — 260 — 20 10.0-10.8′ — 280 — 15 11.8-12.6′ — 300 — 30 13.6-14.4′ — >600 —
-5	5						ORGANICS	
-10	10							
-15	15	S1	1/12"-15-10	24	22			S1: 0-15" Peat with about 40-50% organic silt, trace fine sand, brown. (PT)
-20	20	S2	6-9-11-11	24	8		SAND	15-22" Silty Sand. Widely graded sand with silt and gravel, fine to coarse sand, angular gravel to 3/4" max., 20-30% low plasticity fines, non-stratified, gray. (SM). S2: Silty Sand. Widely graded fine to coarse sand with 10-20% low plasticity fines and 5% fine gravel, nonstratified, gray. (SM).
-25	25							BOTTOM OF BORING 22.0 FEET.
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 25 Sept 1987 / 25 Sept 1987 | PD-26

GROUND ELEVATION (MLW) -1.2 ft. DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A DATE _____ LOGGED BY M. Mahoney, GEI TOTAL DEPTH (FT) 22.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
-5	5					No casing for vane tests. Wash boring using NW casing after vane tests.	ORGANICS	FIELD SHEAR VANE DEPTH TESTED / TORQUE (INCH-LBS) PEAK / RESIDUAL 1.0-1.8′ 80 5 2.8-3.6′ 160 25 4.6-5.4′ 225 35 6.4-7.2′ 160 25 8.2-9.0′ 300 15 10.0-10.8′ 510 35 11.8-12.6′ 600 25 13.6-14.4′ >600 —
-10	10							
-15	15	S1	3-3-2-1	24	16	Could not push vane past 14.5 feet.	SAND	S1: 0-2" Organic Clay with narrowly graded fine sand occasional shells and fiberous brown organic matter, high plasticity fines, olive. (OH). 2-16" Widely Graded fine to coarse sand nonstratified, <5% fines, <5% fine gravel, light gray. (SW).
-20	20	S2	13-24-22-22	24	6			S2: Widely Graded Sand with gravel. Fine to coarse sand, ≈15-20% fine gravel, <5% fines, nonstratified, light gray. (SW).
-25	25							BOTTOM OF BORING 22.0 FEET.
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 21 Sept 1987 / 22 Sept 1987 | PD-27

GROUND ELEVATION (MLW) -0.9 ft | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 32.0 | PG. 1 OF 2

EL. FT	DEPTH FT.	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.		FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED PEAK RESIDUAL 1.0-1.8′ 155 15 2.8-3.6′ 140 30 4.6-5.4′ 210 40
-5	5	U01	PUSH	24	24		ORGANIC CLAY	U01: (tube trimmings) Organic Clay with narrowly graded sand, 5-15 % fine sand, high plasticity <5% shells, moderate organic odor, dark olive. (OH).
-10	10	U02	PUSH	24	24			U02: (tube trimmings) Similar to U01.
		U03	PUSH	24	24			U03: (tube trimmings) Similar to U01 with 15-20% fine sand.
-15	15	U04	PUSH	24	19		PEAT	U04: Top of tube similar to U03. (tube trimmings) Peat. Fibrous brown peat, 30-40% high plasticity organic clay, <5% fine sand, moderate organic odor. (PT).
		S1	WOR-9-9	24	24		SILTY FINE SAND	S1: 0-18" Similar to U04 tube trimmings. 18-24" Silty Sand. Narrowly graded fine sand,<5% medium sand, 25-30% fines, gray. (SM).
-20	20	S2	1-2-13	18	18			S2: 0-6" Similar to S1. 6-12" Similar to S1 with 40-50% low plasticity fines. (SM). 12-18" Silty Sand. Narrowly graded fine sand, 10-20% low plasticity fines, stratified by color into <1/2" layers, oxidation staining, gold brown. (SM).
-25	25	S3	6-6-8-9	24	19			S3: Silty Sand. Narrowly graded fine sand stratified by color into <1/2" layers, one 1" lens of widely graded sand, 10-20% low plasticity fines tan. (SM).
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 21 Sept 1987 / 22 Sept 1987 | PD-27

GROUND ELEVATION (MLW) -0.9 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 32.0 | PG. 2 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
		S4	11-15-21 -24	24	13		S A N D	S4: Widely Graded Sand. Fine to medium sand with 5-15% low plasticity fines, tan. (SW-SM).
								BOTTOM OF BORING 32.0 FEET.
-35	35							
-40	40							
-45	45							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 28 Sept 1987 / 28 Sept 1987 | PD-28

GROUND ELEVATION (MLW) -0.5 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE _____ | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 17.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	SAMPLE BLOWS/ 6 IN.	SAMPLE PEN IN.	SAMPLE REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using HW casing after vane tests.	ORGANICS	FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED — PEAK — RESIDUAL 1.0-1.8′ — 180 — 30 2.8-3.6′ — 180 — 35 4.6-5.4′ — 145 — 30 6.4-7.2′ — 325 — 30 8.2-9.0′ — 310 — 40 10.0-10.8′ — 470 — 35 11.8-12.6′ — 410 — 120
-5	5							
-10	10							
-15	15	S1	3-3-6-12	24	15	Could not push vane below 13.0 feet.	SILTY SAND	S1: Silty Sand. Widely graded fine to medium sand, ≈15% low plasticity fines, ,5% coarse gravel, tan-gray. (SW-SM).
-20	20							BOTTOM OF BORING 17.0 FEET.
-25	25							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 23 Sept 1987 / 23 Sept 1987 | PD-29

GROUND ELEVATION (MLW) -1.2 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 32.0 | PG. 1 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.		FIELD SHEAR VANE TORQUE (INCH-LBS): DEPTH TESTED 1.0-1.8′ PEAK 170 RESIDUAL 40; 2.8-3.6′ 220 40
-5	5	U01	PUSH	23	23		ORGANICS	U01: (tube trimmings) Organic Clay with narrowly graded sand, 5-15% fine sand, occasional shells high plasticity, olive gray. (OH).
		U02	PUSH	24	24			U02: (tube trimmings) Similar to U01 with 15-25 % fine sand.
-10	10	U03	PUSH	24	24			U03: Top of tube similar to U01. (tube trimmings) Silty Sand. Narrowly graded fine sandwith 10-20% low plasticity fines, trace organics, olive gray. (SM).
		U04	PUSH	24	24			U04: Similar to bottom of U03.
-15	15						SILTY SAND	
-20	20	S1	2-3-5-7	24	4	Soil was rising up into casing.		S1: Widely Graded Sand with Silt. Fine to coarse sand with 5-15% fines, nonstratified, gray. (SM).
-25	25	S2	18-12-11 -11	24	4	Blow count may be inflated due to sampler becoming full before 24" penetration.		S2: Sample appears to be wash material.
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 23 Sept 1987 / 23 Sept 1987 | PD-29

GROUND ELEVATION (MLW) -1.2 ft. DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A DATE _____ LOGGED BY M. Mahoney, GEI TOTAL DEPTH (FT) 32.0 | PG. 2 OF 2

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
		S3	5-8-10-11	24	0		S I L T Y / S A N D	S3: No recovery.
								BOTTOM OF BORING 32.0 FEET.
-35	35							
	40							
	45							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON
UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 24 Sept 1987 / 24 Sept 1987 | PD-30

GROUND ELEVATION (MLW) -1.7 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE _____ | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 17.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.	DRGANICS	FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED PEAK RESIDUAL 1.0-1.8′ 150 25 2.8-3.6′ 300 45
-5	5	U01	PUSH	24	24		SILTY SAND	U01: Top of tube - Organic Clay with narrowly graded sand. Fine sand, occasional shells and fibrous brown organic matter, high plasticity fines, olive gray. (OH). Bottom of tube - Silty Sand. Narrowly graded fine sand, 10-20% low plasticity fines, occasional organics, gray. (SM).
-10		S1	4-1-4-3	24	12			S1: Silty Sand. Narrowly graded fine sand with <5% medium sand, 15-25% low plasticity fines, non-stratified gray. (SM).
	10	S2	3-3-5-7	24	12			S2: Widely Graded Sand fine to medium with <5% coarse sand, <5% fines, well stratified by color into <2" layers, gray black. (SW).
-15	15	S3	3-4-4-4	24	3			S3: Silty Sand. Narrowly graded very fine to fine sand, with 35-45% low plasticity fines, light gray. (SM).
-20	20							BOTTOM OF BORING 17.0 FEET.
-25	25							
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 22 Sept 1987 / 23 Sept 1987 | PD-31

GROUND ELEVATION (MLW) -2.1 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE _____ | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 17.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	SAMPLE BLOWS/ 6 IN.	SAMPLE PEN IN.	SAMPLE REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
-5	5					No casing used for vane tests. Wash boring using NW casing after vane tests.	ORGANICS	FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED PEAK RESIDUAL 1.0-1.8′ 110 20 2.8-3.6′ 160 30 4.6-5.4′ 320 50 6.4-7.2′ 295 30 8.2-9.0′ 215 20 10.0-10.8′ 365 40 11.8-12.6′ >600 — 13.6-14.4′ >600 —
-10	10							
-15	15	S1	6-6-3-12	24	14		SILTY SAND	S1: Silty Sand. Widely graded fine to medium sand, with 20-30% low plasticity fines, trace of organics, well stratified by color and texture, gray brown. (SM).
-20	20							BOTTOM OF BORING 17.0 FEET.
-25	25							
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 DATE START/FINISH 24 Sept 1987 / 25 Sept 1987 | PD-32

GROUND ELEVATION (MLW) -2.1 ft. DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A DATE _____ LOGGED BY M. Mahoney, GEI TOTAL DEPTH (FT) 22.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	SAMPLE BLOWS/ 6 IN.	SAMPLE PEN IN.	SAMPLE REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.		FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED / PEAK / RESIDUAL: 1.0-1.8′ 100 10; 2.8-3.6′ 160 25; 4.6-5.2′ 150 35; 6.2-7.0′ 430 50; 8.0-8.8′ 285 60; 9.8-10.6′ 260 50; 11.6-12.2′ >600 —
-5	5						ORGANICS	
-10	10							
-15	15	S1	1-2-9-11	24	12	Could not push vane below 12.7 feet.		S1: 0-6" Sandy Organic Clay. Organic clay with 15-25% narrowly-graded-fine-sand, occasional shells and fibrous brown matter, high plasticity fines olive gray. (OH). 6-12" Widely Graded Sand. Fine to medium sand with <5% fines, nonstratified, light gray. (SW)
-20	20	S2	5-6-6-5	24	8		SAND	S2: Similar to 6-12" portion of S1.
-25	25							BOTTOM OF BORING 22.0 FEET.
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 17 Sept 1987 / 17 Sept 1987 | PD-33

GROUND ELEVATION (MLW) -1.4 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 22.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						After performing field shear vane tests, barge was moved 5 ft east for split spoon sampling.		FIELD SHEAR VANE DEPTH TESTED: TORQUE (INCH-LBS) PEAK / RESIDUAL 0.6-1.4′: 130 / 30 2.4-3.2′: 420 / 18 3.2-4.2′: 278 / 80 4.2-5.0′: 320 / 40 6.0-6.8′: 410 / 60 6.8-7.6′: 540 / 80
-5	5	S1	WOR	24	8	No casing used for vane tests.		
						Wash boring using NW casing after vane tests.	GANIC CLAY	S1: Organic Clay. <10% fibrous brown organic matter occasional shells, high plasticity, olive gray top 3" of sample was black. (OH).
-10	10	S2	WOR	24	24			S2: Sandy Organic Clay. 10-20% fine sand, occasional shells, high plasticity, olive gray. (OH).
-15	15	S3	WOR	24	12			S3: Similar to S2. Shoe of spoon contained 1" of gray fine sand with clay. (OH).
-20	20	S4	5-8-9-11	24	20		SAND SW SP	S4: 0-15" Widely Graded Sand with Gravel. Fine to coarse sand with 20-30% gravel to 1", <5% fines ——, brown. (SW). 15-20" Silty Sand. Narrowly graded fine sand, 25-30% low plasticity fines, stratified by color into <1/2" layers, red-brown. (SP). BOTTOM OF BORING 22.0 FEET.
-25	25							
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 17 Sept 1987 / 18 Sept 1987 | PD-34

GROUND ELEVATION (MLW) -0.6 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 17.0 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	SAMPLE BLOWS/ 6 IN.	SAMPLE PEN IN.	SAMPLE REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.		FIELD SHEAR VANE TORQUE (INCH-LBS) DEPTH TESTED — PEAK — RESIDUAL 1.0-1.8′ — 100 — 30 2.8-3.6′ — 397 — 30
-5	5	U1	PUSH	24	0		ORGANIC CLAY	U1: No recovery. Olive gray organic clay adhered to outside of tube with occasional shells.
		U2	PUSH	24	8			U2: Sandy Organic Clay. 10-20% fine sand, occasional shells, one piece of glass, one 3"shell,high plasticity, olive gray with zones of black (OH)
-10	10	U3	PUSH	24	23			U3: Sandy Organic Clay. (tube trimmings) 10-20% narrowly graded fine sand, trace shell fragments, trace fibrous brown organics, strong organic odor, olive gray. (OH).
		U4	PUSH	24	10			UF4: (Piston Slipped 10") soil similar to U3.
-15	15	U5	PUSH	24	23			UF5: Similar to U3.
-20	20							BOTTOM OF BORING 17.0 FEET.
-25	25							
-30								

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON
UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

BORING LOCATION See Fig. 2 | DATE START/FINISH 21 Sept 1987 / 21 Sept 1987 | PD-34A

GROUND ELEVATION (MLW) -0.4 ft. | DRILLED BY D. Serowik, Guild Drilling

GROUNDWATER EL. N/A | DATE - | LOGGED BY M. Mahoney, GEI | TOTAL DEPTH (FT) 8.5 | PG. 1 OF 1

EL. FT	DEPTH FT	SAMPLE TYPE & No.	BLOWS/ 6 IN.	PEN IN.	REC. IN.	REMARKS		SOIL AND ROCK DESCRIPTIONS
						No casing used for vane tests. Wash boring using NW casing after vane tests.	SANDY DRGANIC CLAY	
-5	5	U01	PUSH	24	24			U01: (Tube trimmings) Sandy Organic Clay. 10-20% narrowly graded fine sand, low plasticity, 10-20% shells, strong organic odor, olive gray. (OL).
		U02	PUSH	24	24			U02: Similar to U01.
-10	10							BOTTOM OF BORING 8.5 FEET.
-15	15							

BLOWS PER 6"-140LB. HAMMER FALLING 30" TO DRIVE A 2.0 IN. OD SPLIT SPOON SAMPLER
PEN-PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC-RECOVERY LENGTH OF SAMPLE
RQD-LENGTH OF SOUND CORES>4 IN./LENGTH CORED, %
S-SPLIT SPOON SAMPLE
U-UNDISTURBED SAMPLE UF-FIXED PISTON UO-OSTERBERG
▼ GROUNDWATER

NOTES:
1). All depths are referenced to river bottom.

NEW BEDFORD SUPERFUND SITE
NEW BEDFORD, MA
DATE 13 Nov 87 PROJECT 87311

G E I

APPENDIX B

TEST PIT LOGS

TEST PIT LOG

TP-1

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 22 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 6.0 ft
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Silty Sand. Widely graded, predominantly fine to coarse sand, 10-15% fines, 10% gravel to 3", 40% by volume angular cobbles and boulders to 3'max. dimension, tan. (SM).
2	
3 ▽	3.2 feet
4	BOTTOM OF HOLE 4 FEET.
5	
6	

REMARKS:
1) Samples collected by Corps personnel: 1 composite sample

PIT DIMENSIONS (FT)
LENGTH 11
WIDTH 6
DEPTH 4

GEI

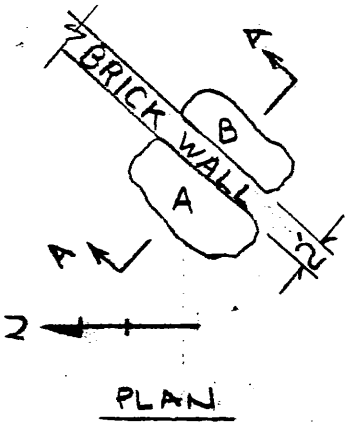
TEST PIT LOG

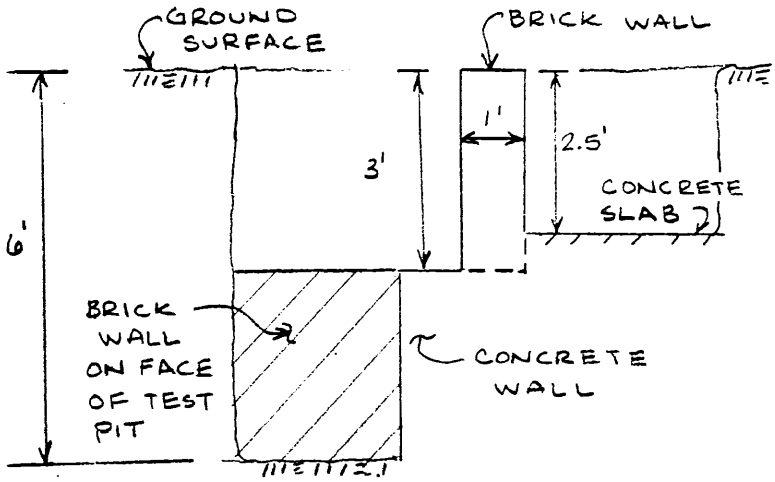
TP-2

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 22 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 10.8 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION (PIT A)
1	0-0.1′ TOPSOIL 0.1-0.6′ Narrowly Graded Sand. Fine to very fine sand, <5% fines, dark gray-green. (SP). 0.6-1.0′ Leather Scraps, Glass, and Wood.(FILL)
2	1.0-5.0′ Brick Rubble. Bricks and mortar, some metal pipes. Matrix of silty sand, widely graded fine to medium sand, 10-15% fines, black.(FILL)
3	
4	
5	5.0-6.0′ Silty Sand. Widely graded fine to medium sand, 10-15% fines, 5-10% gravel to 2" max. size, light orange-brown. (SW-SM).
6	BOTTOM OF HOLE 6 FEET.
7	
8	





SECTION A-A
LOOKING NORTHEAST

REMARKS:
1) Samples collected by Corps personnel: 1 from 0.1-0.6′
1 composite

2) No groundwater observed.

PIT DIMENSIONS (FT)

	A	B
LENGTH	10	8
WIDTH	3.5	3
DEPTH	6	2.5

GEI

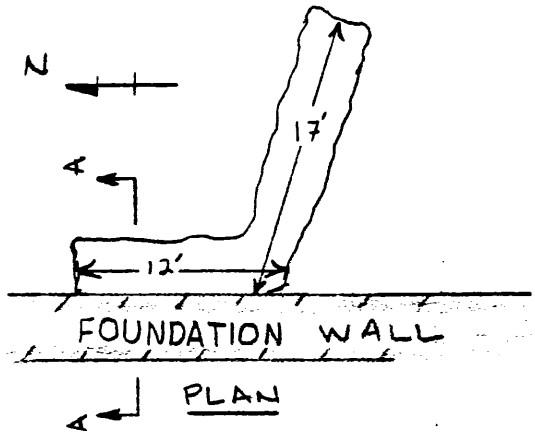
TEST PIT LOG

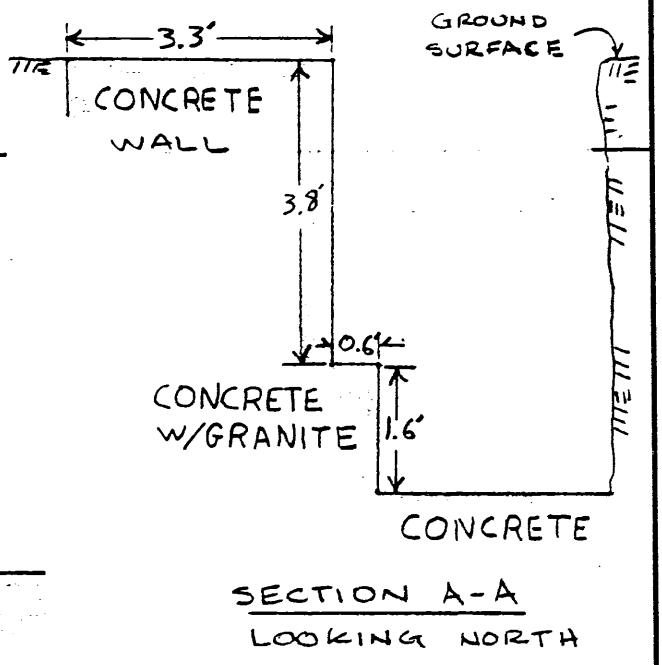
TP-3

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.7 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1–2	Silty Sand. Widely graded fine to medium sand, 10-15% fines, many cinders and slag black, (layer get thicker to east: extends to 6' deep 17' away).(FILL)
3–5	Widely Graded Sand. Medium to coarse sand, 5-10% rounded gravel to 2" max. size, 5-10% fines, tan. (SW-SM).
6 ▽	6.0 feet
7–8	BOTTOM OF HOLE 6.5 FEET.





REMARKS:
1) Samples collected by Corps personnel: 1 from 0-1.0'
1 from 1-2.5'
1 composite
2) Sample taken at 4' by GEI for gradation test.

PIT DIMENSIONS (FT)
LENGTH 12, 17
WIDTH 3.5
DEPTH 6.5

GEI

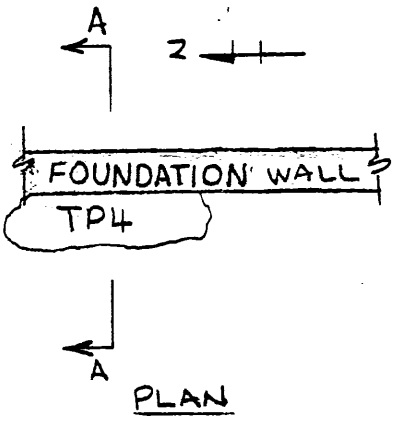
TEST PIT LOG

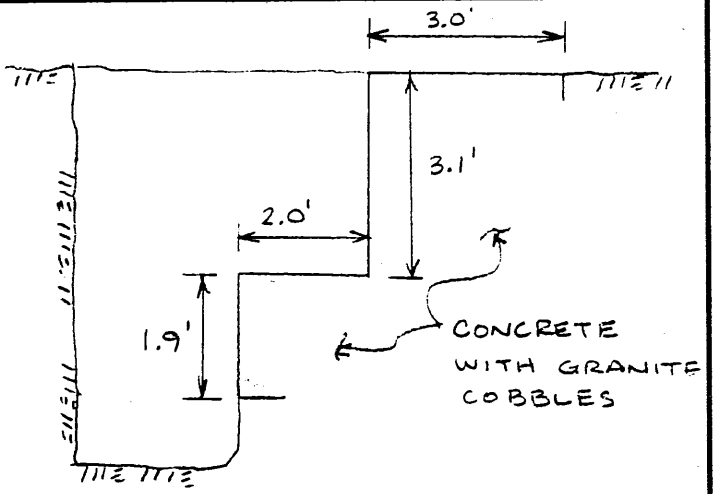
TP-4

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.4 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Silty Sand. Widely graded fine to medium sand, 10-15% fines, many cinders and slag, sheet metal, some bricks, black.(FILL)
2	1.0-1.6′ Narrowly Graded Sand. Fine to medium sand, <5% fines, light yellow-tan. SP. 1.6-2.0′ Narrowly Graded Sand. Fine to medium sand, 5-10% fines, light brown-beige. (SP-SM).
3	2.0-3.0′ Widely Graded Sand with gravel. Fine to coarse sand, 10-15% gravel to 3" max. size, 5-10% fines, occasional cobbles, light orange brown. (SW-SM). grading to 3.0-5.5′ Narrowly Graded Sand. Fine to medium sand, 5-10% fines, light orange brown. (SP-SM).
4	
5	
6 ▽ 5.9 ft.	5.5-6.0′ Narrowly Graded Sand. Fine to very fine sand, 5-10% silt, light orange-brown. (SP-SM).
7	BOTTOM OF HOLE 6.0 FEET.
8	





REMARKS:
1) Samples collected by Corps personnel: 1 from 0-1.0′
1 from 1.6-2.0′

2) Sample collected from 3.0-4.0′ by GEI for gradation tests.

PIT DIMENSIONS (FT)
LENGTH 10
WIDTH 4.5
DEPTH 6.0

GEI

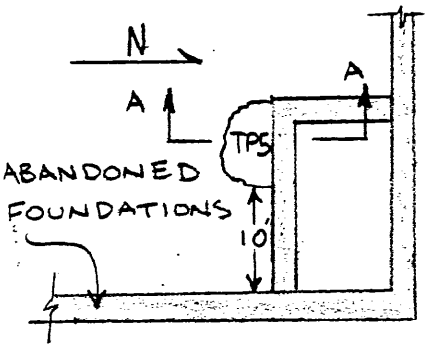
TEST PIT LOG

TP-5

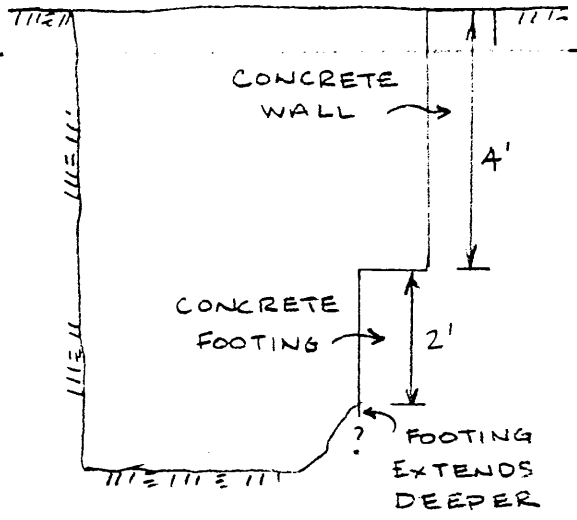
PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.1 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Brick Rubble. Bricks and mortar, matrix of widely graded silty sand, predominantly medium to fine sand, 10-15% fines, black.(FILL)
2	
3	
3.5	
4	Silty Sand with Gravel. Widely graded fine to coarse sand, 10-15% gravel to 3" max. size, 10-15% fines, occasional cobbles, tan. (SW-SM).
5	
6 ▽	6.0 feet
7	BOTTOM OF HOLE 7 FEET.
8	
9	



PLAN



SECTION A-A

REMARKS:
1) Samples collected by Corps personnel: 1 composite

PIT DIMENSIONS (FT)
LENGTH 10
WIDTH 5.5
DEPTH 7

GEI

TEST PIT LOG

TP-6

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.4 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	0-1.0' Brick Rubble. Brick and mortar, matrix of silty sand, widely graded fine to medium sand, 10-15% fines, black.(FILL) 1.0-1.6' Ash. Ash with narrowly graded sand, mostly medium sand, occasional gravel to 2" max. size, light gray to brown.(FILL)
2	1.6-3.0' Narrowly Graded Sand. Fine to medium sand, 5-10% fines, tan. (SP-SM)
3	3.0-4.0' Widely Graded Sand with Gravel. Fine to coarse sand, 10-15% gravel to 2" max. size, 5-10% fines, light orange-brown. (SW-SM).
4	4.0-7.0' Silty Sand. Narrowly graded fine to medium sand, 10-15% fines, tan. (SP-SM).
5	
6 ▽	6.0 feet
7	7.0-7.5' Silty Sand. Narrowly graded organic very fine to fine sand, 15-20% fines, contains significant organic matter. (SP-SM)
8	BOTTOM OF HOLE 7.5 FEET.
9	

REMARKS:
1) Samples collected by Corps Personnel: 1 composite
2) Bottom of foundation not encountered.

PIT DIMENSIONS (FT)
LENGTH 10
WIDTH 5
DEPTH 7.5

GEI

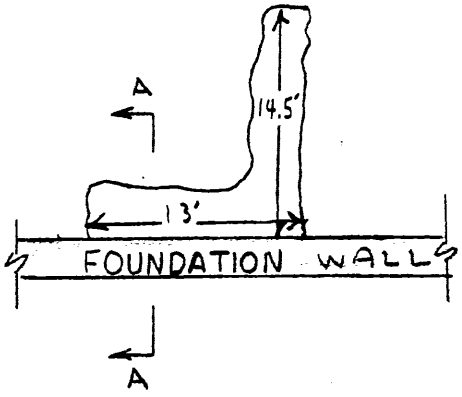
TEST PIT LOG

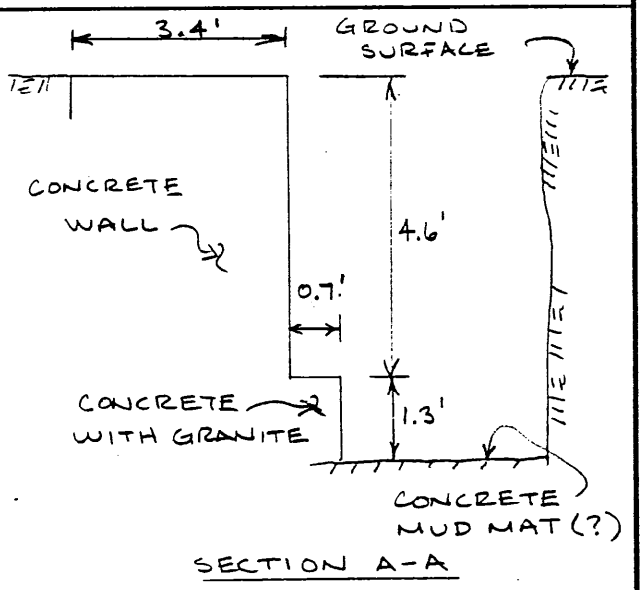
TP-7

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.9 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
0.6	Widely Graded Sand. Medium to coarse sand 15-20% gravel to 2" max. size, <5% fines, many cinders, slag, some bricks and cobbles, black.(FILL)
1	0.6-1.1' Widely Graded Sand with Gravel. Medium to coarse sand, about 15% gravel to 3" max. size, occasional cobbles, <5% fines, tan. (SW).
	1.1-2.0' Similar to surface layer. (FILL)
2	
	Widely Graded Sand. Medium to coarse sand, 5-10% rounded gravel to 2" max. size, occasional cobbles, 5-10% fines, tan. (SW).
3	
4	
5	
6 ▽	6.0 feet
7	BOTTOM OF HOLE 6.5 FEET.





REMARKS:

PIT DIMENSIONS (FT)
LENGTH 13 14.5
WIDTH 4
DEPTH 6.5

GEI

TEST PIT LOG

TP-8

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 22 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 8.7 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Brick Rubble. Bricks and mortar, metal pipes, timbers, scrap metal. Matrix of silty sand, widely graded, fine to medium sand, 10-15% fines, brown-black. (FILL)
2	
3	
4	Refusal, concrete slab
	BOTTOM OF HOLE 4.2 FEET.
5	
6	

REMARKS:
1) Samples collected by Corps personnel: 1 composite

2) No groundwater encountered.

PIT DIMENSIONS (FT)
LENGTH 18
WIDTH 10
DEPTH 4.2

GEI

TEST PIT LOG

TP-9

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 21 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 11.0 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Asphalt. Asphalt slabs, some bricks, matrix of silty sand, widely graded fine to medium sand, 10-15% fines, 5-10% gravel to 2" max. size, light brown.(FILL)
1.8 / 2	Widely Graded Sand with Silt. Fine to medium sand with about 10-15% fines, many cinders, glass, bricks, steel pipe, black.(FILL)
3	
3.5 / 4	Silty Sand with Gravel. Widely graded fine to coarse sand, 15-20% gravel to 2" max. size, 10-15% fines, many cobbles, light yellow-brown. (SW-SM).
5	
6 ▽	6.5 feet
7	BOTTOM OF HOLE 7 FEET.
8	
9	

REMARKS:
1) Samples collected by Corps personnel: 1 composite
1 from 1.8-3.5'

PIT DIMENSIONS (FT)
LENGTH 10
WIDTH 5
DEPTH 7

GEI

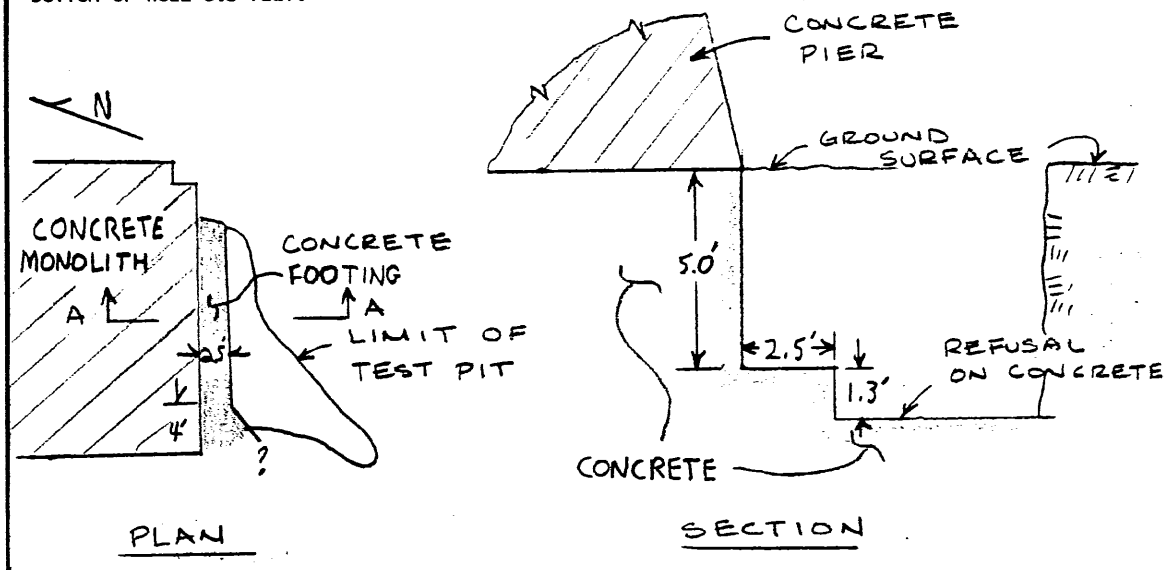
TEST PIT LOG

TP-10

PROJECT NEW BEDFORD SUPERFUND SITE
LOCATION NEW BEDFORD, MA
CLIENT U.S. ARMY CORPS OF ENGINEERS
CONTRACTOR/EQUIPMENT J.S. LUIZ, INC. / FORD 750
OBSERVED BY B. KILCOYNE, GEI DATE 22 SEPT 1987

PROJECT NO. 87311
LOCATION See Fig. 2
GROUND EL. 12.0 ft.
DATUM MLW

DEPTH BELOW GROUND SURFACE (FT)	SOIL DESCRIPTION
1	Brick Rubble. Bricks, mortar and concrete, many bottles, broken glass, scrap metal, wire, wood, matrix of silty sand, widely graded medium to fine sand, 10-15% fines, dark brown.(FILL)
2	
3	
4	
5	
6	Concrete pad or mud mat. BOTTOM OF HOLE 6.3 FEET.
7	
8	



REMARKS:

1) No groundwater encountered.

PIT DIMENSIONS (FT)
LENGTH Irregular
WIDTH Irregular
DEPTH 6.3

GEI

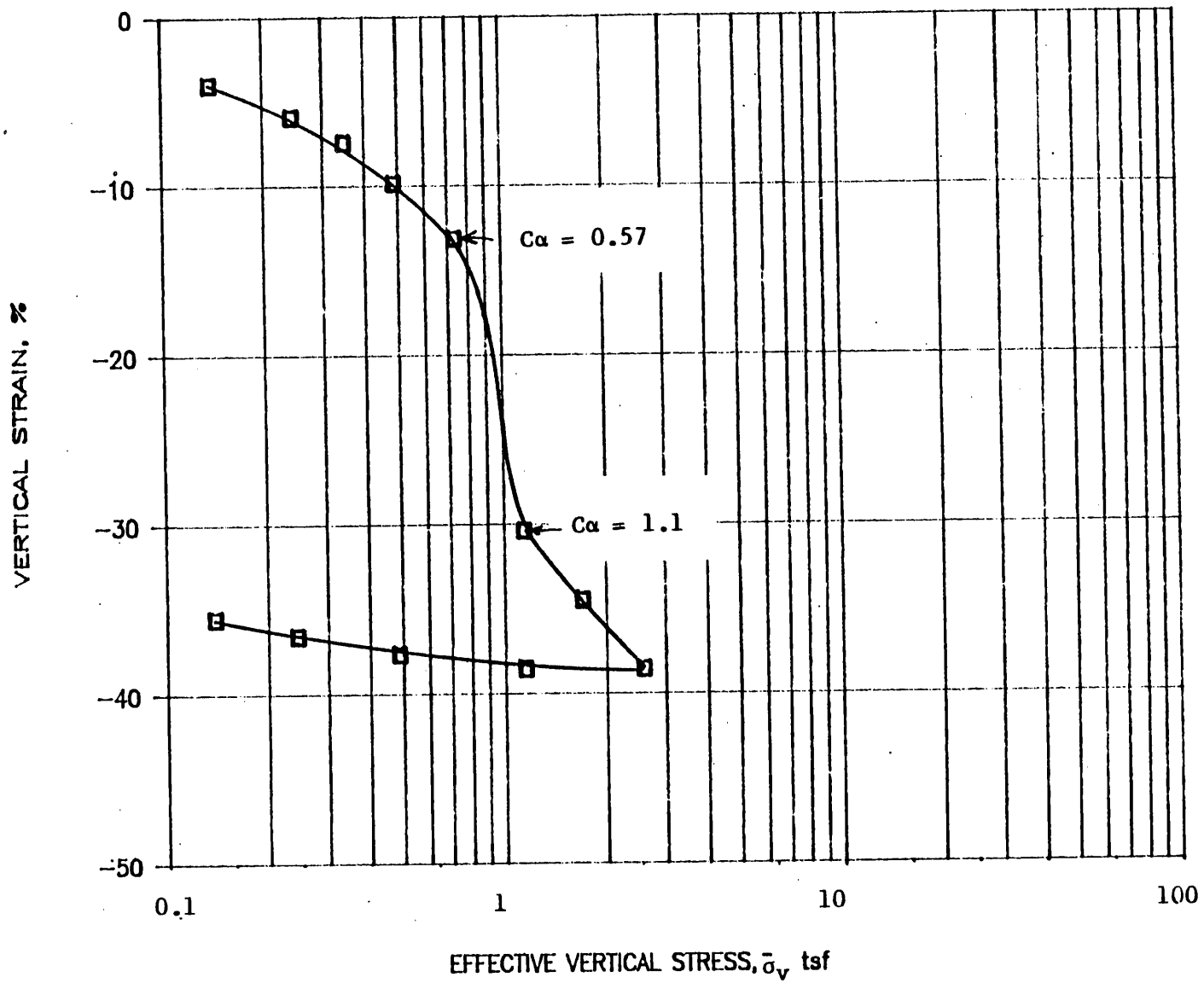
APPENDIX C

ENGINEERING PROPERTIES TEST RESULTS

One Dimensional Consolidation

Unconsolidated Undrained (Q) Triaxial

Consolidated Undrained (R) Triaxial



SOIL
PD34A,UO2/C
Organic Clay. (OH)
LL =116 PI =81

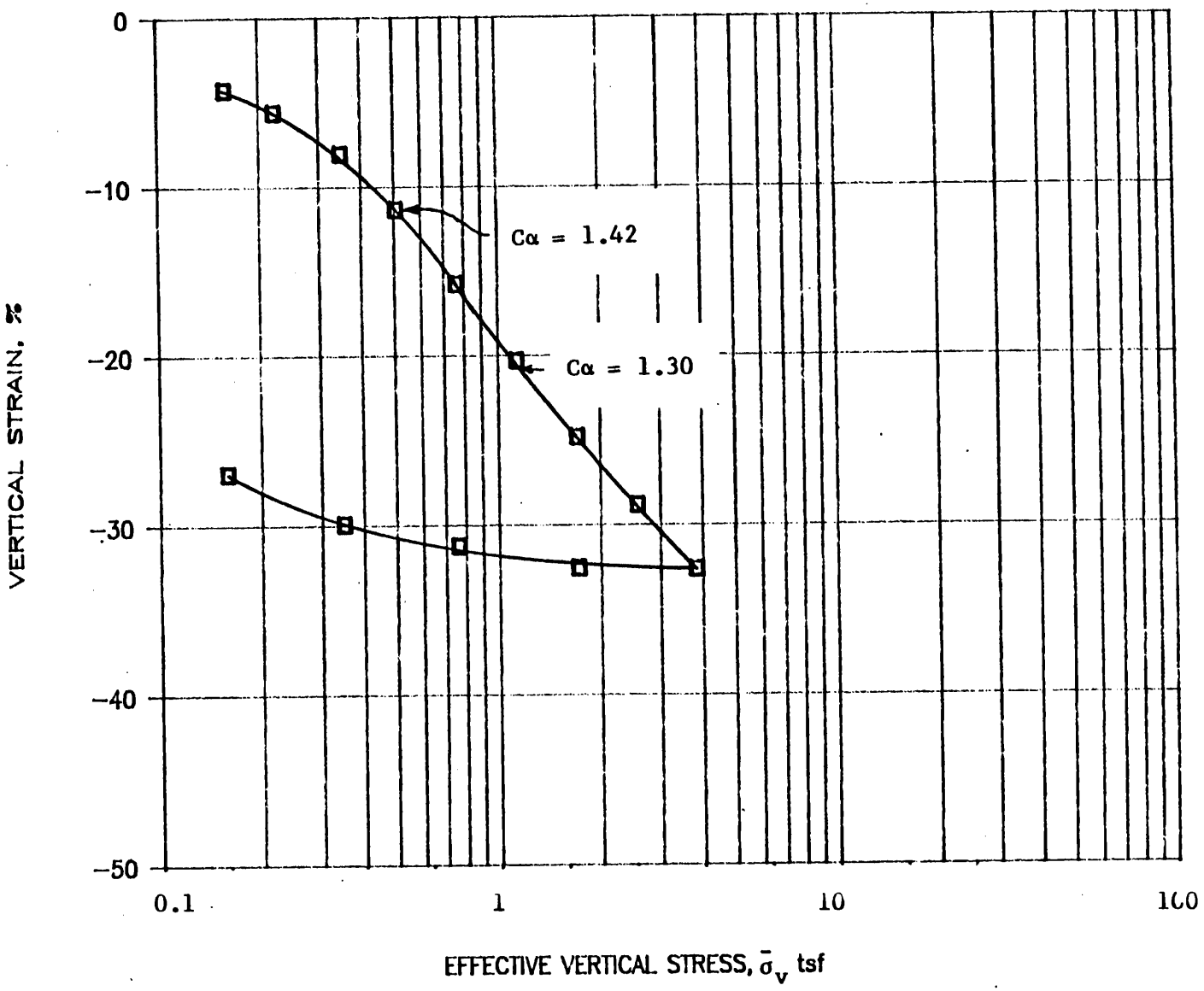
STRUCTURE
Undisturbed Osterberg Sample.

STATE
e_o = 3.048 w_o = 118 %
S_o = 100 %

LOADING
One-dimensional compression.

TEST DETAILS
Dia. = 2.5 in.
Ht. = 0.5 in.
Load incr. ratio = .5
Time of curve = 480 min.

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	COMPRESSION CURVE TEST C1
GEI Winchester, Massachusetts	Project 87311	Nov. 13, 1987 Fig.C1



SOIL
PD34 ,U 5/B
Organic Clay.(OH)
LL =103 PI =67

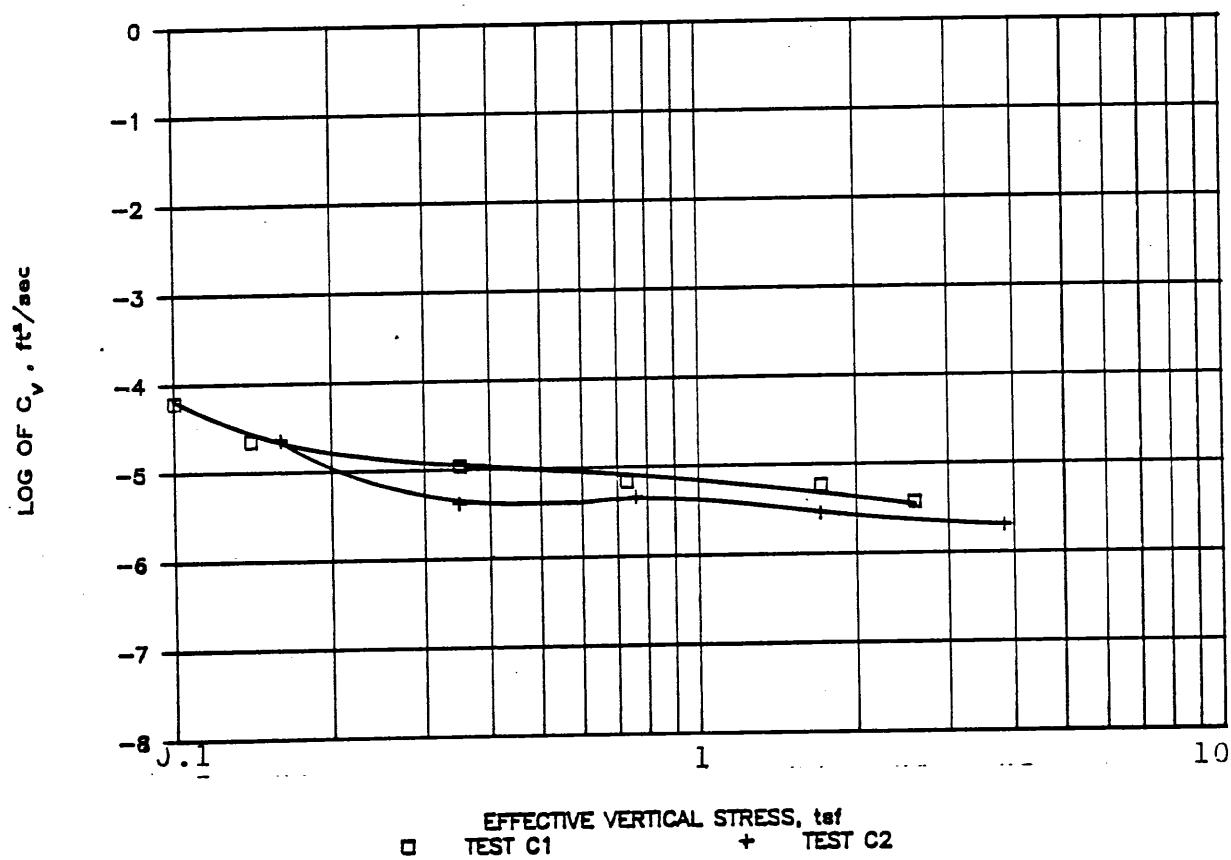
STRUCTURE
Undisturbed Osterberg Sample.

STATE
e_o = 2.321 w_o = 90 %
S_o = 99.4 %

LOADING
One-dimensional compression.

TEST DETAILS
Dia. = 2.5 in.
Ht. = 0.5 in.
Load incr. ratio = .5
Time of curve = 480 min.

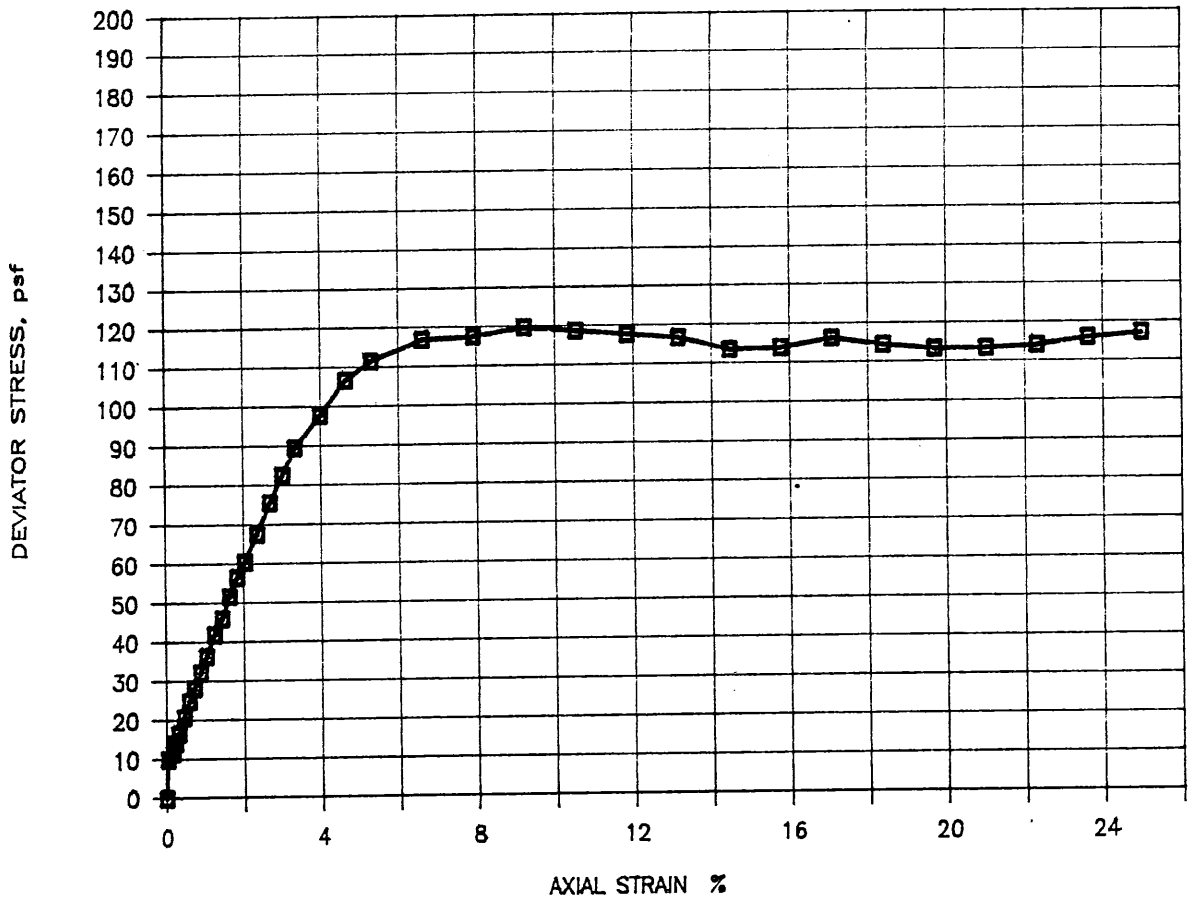
US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	COMPRESSION CURVE TEST C2
GEI Winchester,Massachusetts	Project 87311	Nov. 13, 1987 Fig.C2



Notes:

1) C_v based on t_{90} on square root of time consolidation curve.

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	COEFFICIENT OF CONSOLIDATION
GEI Winchester, Massachusetts	Project 87311	Nov. 13, 1987 Fig.C3



Soil: Boring PD27 , Sample UO1 , Depth = 6.8 ft.
Organic Clay.(OH)

LL = 122 PI = 87

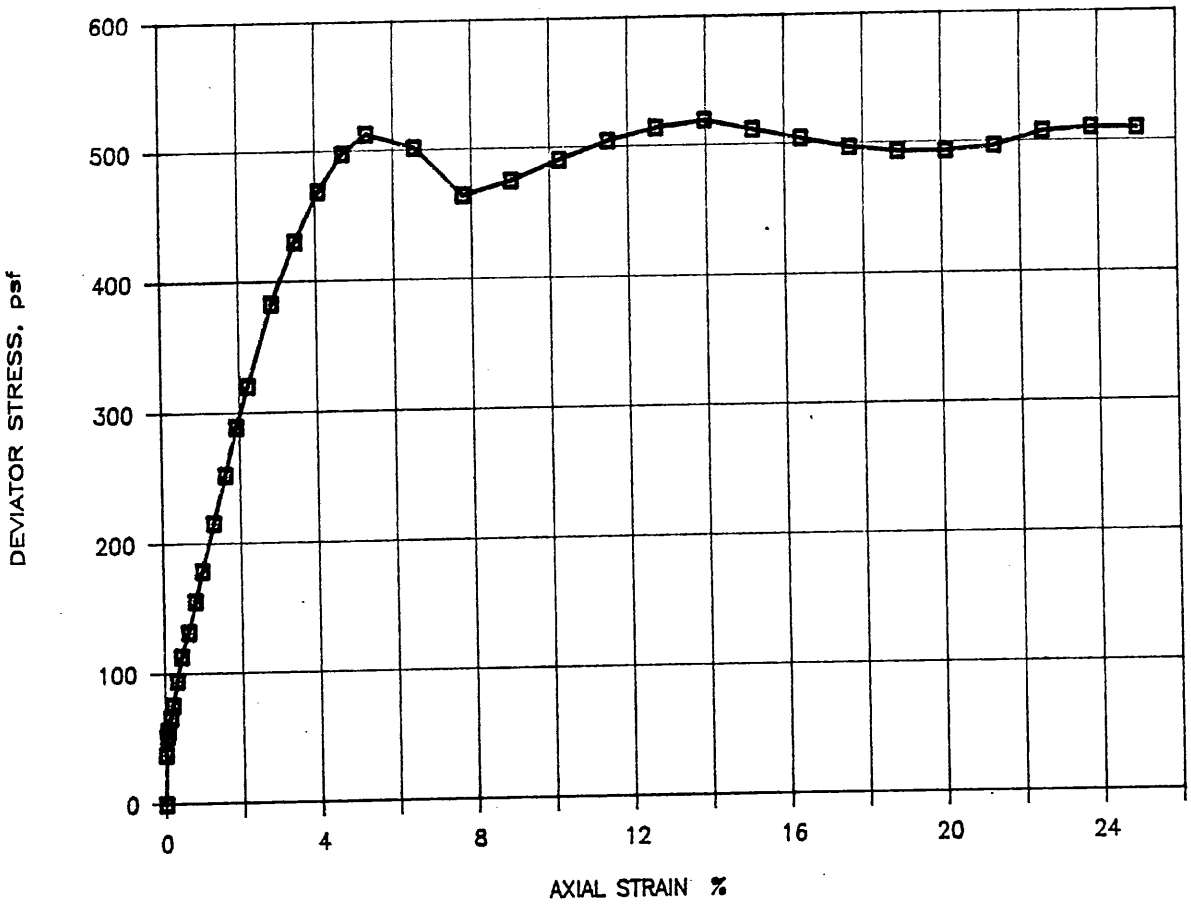
Structure: Undisturbed 3 - inch dia. tube sample

State: Cell Pressure = 410 psf
Natural Moisture Content = 128 %
Dry Unit Weight = 37.9 pcf

Loading: Axial compression, unconsolidated, undrained.
Strain rate = 0.50 %/min.

Nominal Size: Height = 6.0 inches
Diameter = 2.8 inches

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST Q1
GEI Winchester,Massachusetts	Project 87311	Nov. 13, 1987 Fig.C4



Soil: Boring PD34 , Sample U5 , Depth = 16.6 ft.
Organic Clay.(OH)
LL = 103 PI = 67

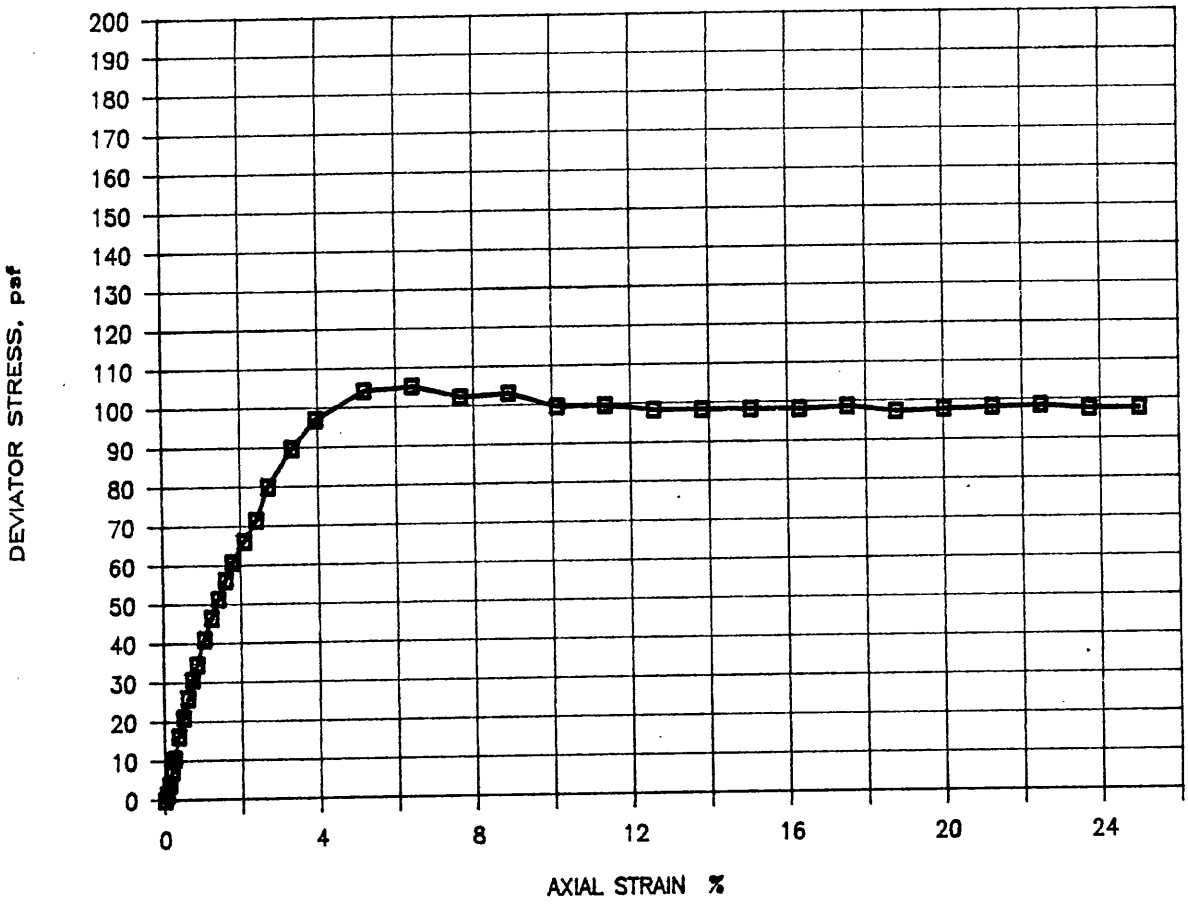
Structure: Undisturbed 3 - inch dia. tube sample

State: Cell Pressure = 410 psf
Natural Moisture Content = 86 %
Dry Unit Weight = 49.6 pcf

Loading: Axial compression, unconsolidated, undrained.
Strain rate = 0.50 %/min.

Nominal Size: Height = 6.4 inches
Diameter = 2.8 inches

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST Q2
GEI Winchester,Massachusetts	Project 87311	Nov. 13, 1987 Fig.C5



Soil: Boring PD29 , Sample UO2 , Depth = 8.5 ft.
Organic Clay.(OH)
LL = 83 PI = 58

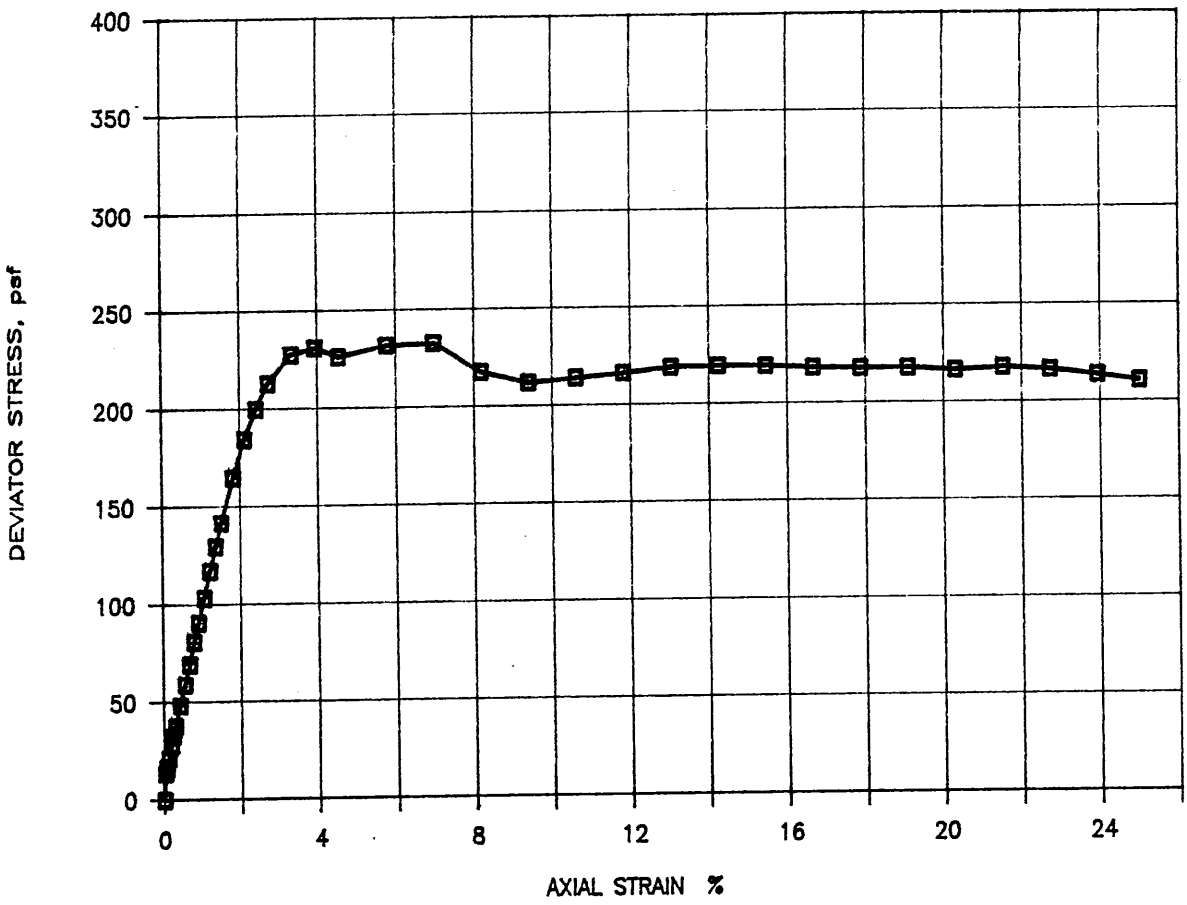
Structure: Undisturbed 3 - inch dia. tube sample

State: Cell Pressure = 410 psf
Natural Moisture Content = 92 %
Dry Unit Weight = 47.1 pcf

Loading: Axial compression, unconsolidated, undrained.
Strain rate = 0.50 %/min.

Nominal Size: Height = 6.4 inches
Diameter = 2.8 inches

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST Q3
GEI Winchester,Massachusetts	Project 87311	Nov. 13, 1987 Fig.C6



Soil: Boring PD27 , Sample UO2 , Depth = 9.5 ft.
Organic Clay.(OH)
LL = 104 PI = 71

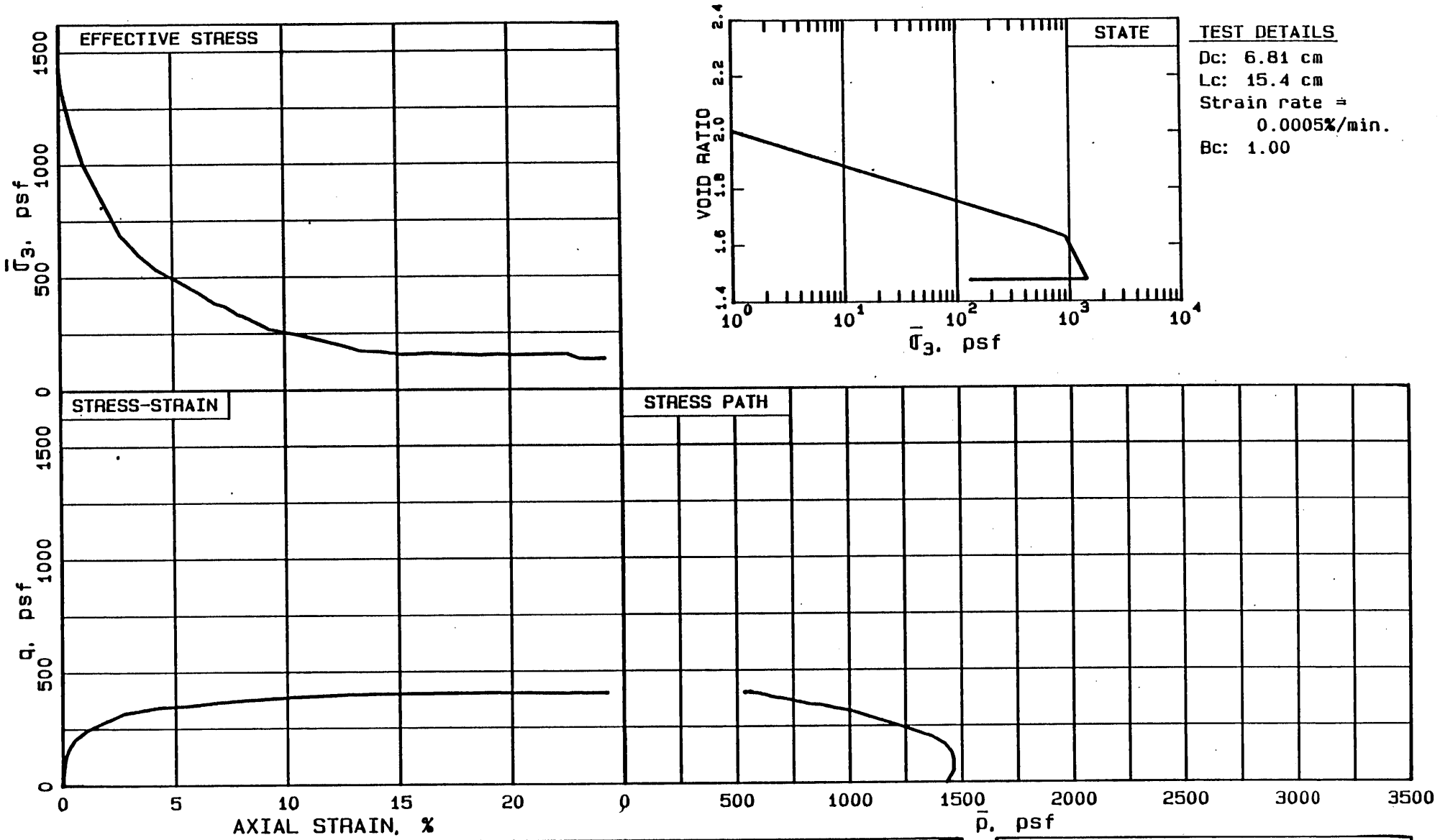
Structure: Undisturbed 3 - inch dia. tube sample

State: Cell Pressure = 410 psf
Natural Moisture Content = 103 %
Dry Unit Weight = 44.3 pcf

Loading: Axial compression, unconsolidated, undrained.
Strain rate = 0.50 %/min.

Nominal Size: Height = 6.5 inches
Diameter = 2.8 inches

US Army Corps of Engineers - NED	Exploration Program New Bedford Superfund Site	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST Q4
GEI Winchester, Massachusetts	Project 87311	Nov. 13, 1987 Fig. C7



TEST DETAILS

Dc: 6.81 cm
Lc: 15.4 cm
Strain rate = 0.0005%/min.
Bc: 1.00

SOIL	Boring PD-34, Sample U3/C Brown Organic Clay (OH)
STRUCTURE	Undisturbed fixed-piston tube sample.

STATE	$\bar{\sigma}_{3c}$ = 1434 psf e_c = 1.476 K_c = 1.00 γ_{dc} = 65.5 pcf
LOADING	Undrained, monotonic, axial compression

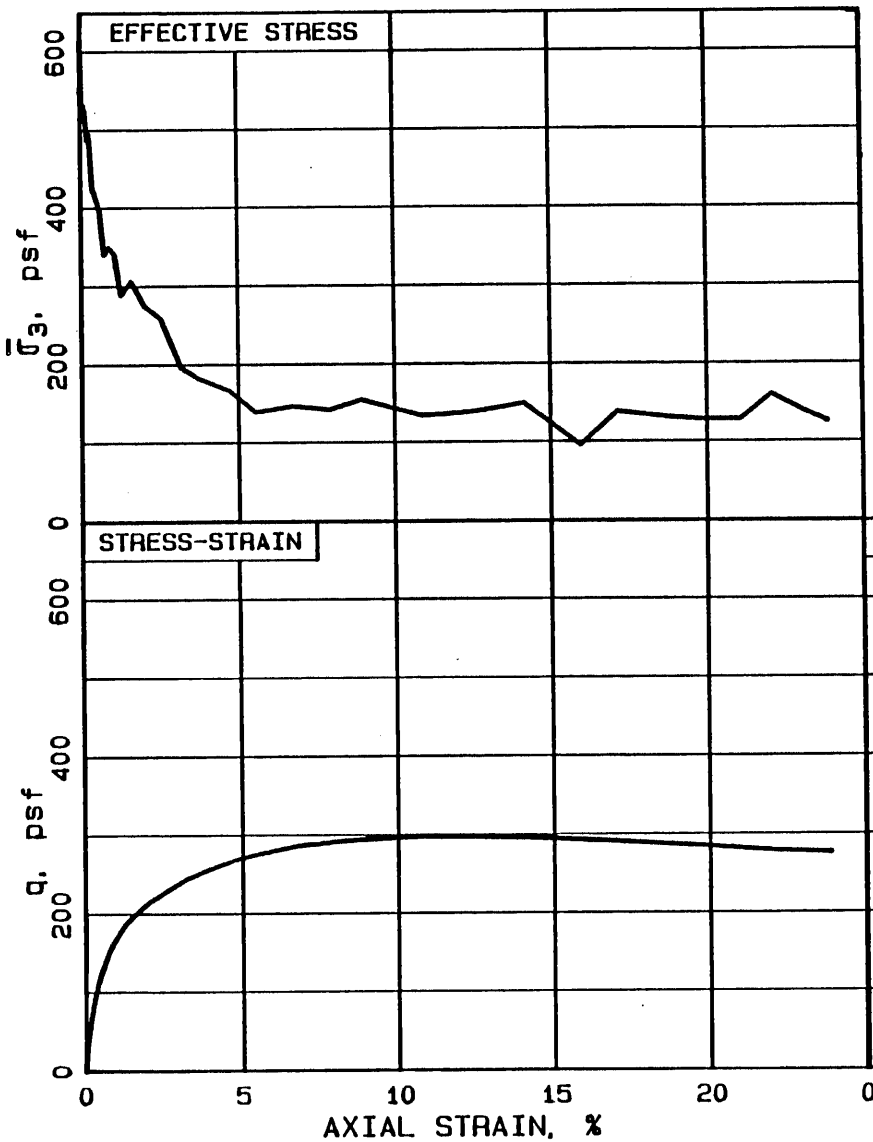
$\bar{R}$-1

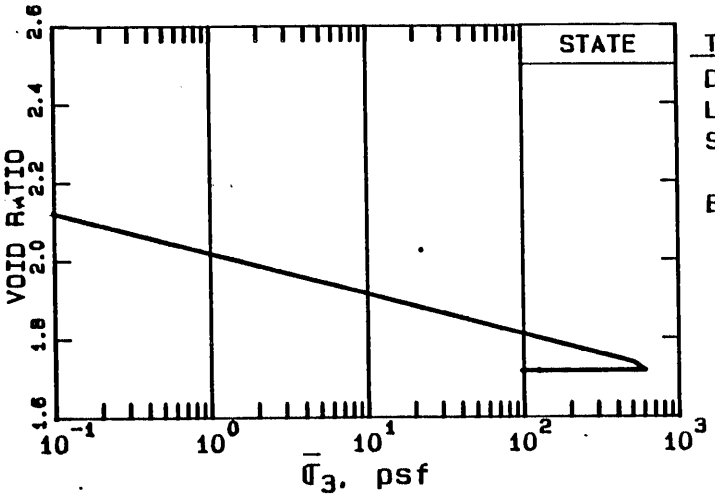
NEW BEDFORD SUPERFUND SITE

PROJECT 87311 Nov. 13, 1987

GEOTECHNICAL ENGINEERS INC.
WINCHESTER - MASSACHUSETTS

Fig. C8





TEST DETAILS

Dc: 6.88 cm
Lc: 15.2 cm
Strain rate = 0.0005%/min.
Bc: 0.95

SOIL	Boring PD-29, Sample U02/C Brown Organic Clay (OH)	**STATE**	$\bar{\sigma}_{3c}$ = 614 psf e_c = 1.718 K_c = 1.00 γ_{dc} = 59.7 pcf
STRUCTURE	Undisturbed Osterberg tube sample.	**LOADING**	Undrained, monotonic, axial compression

Fig. C9

$\bar{R}$-2

NEW BEDFORD SUPERFUND SITE

PROJECT 87311 Nov. 13, 1987

GEOTECHNICAL ENGINEERS INC.
WINCHESTER - MASSACHUSETTS

APPENDIX D

HEALTH & SAFETY PLAN

HEALTH AND SAFETY PLAN
FOR
FIELD EXPLORATION PROGRAM
NEW BEDFORD SUPERFUND SITE
Bristol County, Massachusetts
Delivery Order No. 3
Contract No. DACW33-87-D-0002

September 8, 1987

Prepared for

New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

by

Geotechnical Engineers Inc.
1021 Main Street
Winchester, Massachusetts 01890
(617) 721-4000

Project 87311

Stephen L. Whiteside

Stephen L. Whiteside, P.E.
Project Manager

HEALTH AND SAFETY PLAN
FOR
FIELD EXPLORATION PROGRAM
NEW BEDFORD SUPERFUND SITE
Bristol County, Massachusetts
Delivery Order No. 3
Contract No. DACW33-87-D-0002
GEI Project No. 87311

1. PURPOSE

The United States Army Corps of Engineers (USACE) has been tasked by the United States Environmental Protection Agency (EPA) to perform additional predesign studies for the New Bedford Superfund Site. The purpose of these studies will be to develop technical information and to evaluate the engineering feasibility of various dredging and disposal alternatives for the upper harbor sediment which contains elevated levels of polychlorinated biphenyls (PCB's). In support of these studies the New England Division (NED-USACE) has been assigned project management responsibilities for a pilot study of dredging and disposal alternatives.

The pilot study will be conducted in the vicinity of a small cove located just north of the Coggeshall Street Bridge on the New Bedford side of the harbor. The purpose of Delivery Order No. 3 to be performed by GEI for the NED-USACE is to perform field and laboratory investigations to obtain geotechnical data for the NED-USACE evaluation of the subsurface conditions in the pilot study area. Guild Drilling Co. is the drilling contractor for the work.

The exploration program will require handling of and exposure to sediments known to be contaminated with PCB's and toxic heavy metals. Unless appropriate precautions are taken by personnel engaged in the sediment sampling operations, exposures to the hazardous chemicals contained in the sediments may occur that could result in illness or injury. The purpose of this Health and Safety Plan is to specify protective equipment and identify procedures for avoiding personal exposures to harmful levels of the toxic chemicals of concern. It is also intended to provide for contingencies in responding to exposures or accidents that may arise while field exploration operations are being conducted.

2. APPLICATION

The provisions of this Health and Safety Plan are mandatory for all drilling and sampling activities associated with the off-shore borings to be performed through the harbor

sediments using a barge-mounted drill rig, as summarized in the "Work Description" section of this document. All personnel engaged in sediment sampling operations or in the immediate vicinity of such sampling shall be familiar with this Plan and comply with its requirements. If field activities are modified after the issue date of this Plan, the hazards associated with the modified activities must be reassessed and the site specific provisions of this Plan modified accordingly.

3. RESPONSIBILITIES

GEI Project Manager

The GEI project manager (or his designated on-site coordinator) shall direct the on-site investigation and operation efforts. The GEI project manager is Mr. Stephen L. Whiteside and his designated on-site coordinator is Mr. Mark T. Mahoney. At the site, the project manager or on-site coordinator has the primary responsibility for:

1. Assuring that appropriate personnel protective equipment is available and properly utilized by all GEI personnel potentially exposed to contaminants. Guild Drilling Co. is responsible for providing protective equipment for their personnel and requiring its use as required by this Health and Safety Plan.

2. Assuring that personnel are aware of the provisions of this Plan, and are instructed in the work practices necessary to ensure safety and in procedures for dealing with emergencies. Guild Drilling Co. will instruct their drilling personnel before they arrive at the site.

3. Assuring that personnel are aware of potential hazards associated with site operations.

4. Monitoring the safety performance of all personnel to evaluate whether the required work practices are employed, and directing corrective action, as necessary.

5. Correcting any work practices or conditions that may result in injury or exposure to the hazardous substances.

6. Preparing any accident/incident reports, as necessary.

Project Personnel

GEI, Guild, and NED-USACE project personnel involved in on-site investigations and operations are responsible for:

1. Taking all responsible precautions to prevent injury to themselves and to their fellow workers.

2. Implementing the project Health and Safety Plan, and reporting to the project manager or on-site coordinator any deviations from the anticipated conditions described in the Plan.

3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the project manager or his designee.

4. SITE DESCRIPTION

The site is located in the vicinity of a small cove located just north of the Coggeshall Street Bridge on the New Bedford side of the harbor. A site plan is shown in Appendix A. Previous investigations have shown that high levels of PCB's are present in the harbor sediments, generally 1000-5000 ppm (dry weight), with some measurements greater than 10,000 ppm and some less than 1 ppm. The two measurements made in the harbor sediments in the pilot study area were 260 ppm and 0.259 ppm. Thus, the level of PCB contamination is variable in the harbor. There have been no measurements made on shore in the pilot study area. The NED-USACE do not expect PCB contamination on shore.

5. WORK DESCRIPTION

The field exploration program for Delivery Order No. 3 is planned to include 10 borings on water, 5 borings on land, and approximately 12 test pits on land. The proposed locations, depths, and other requirements for the borings and test pits are shown in the NED-USACE scope of work in Appendix A. Land sites will require Level D protection (The NED-USACE have indicated that no significant contaminants are known.) Water sites will require protective clothing primarily because of PCB contamination. Guild Drilling Co. will perform the borings and test pits. GEI will provide inspection and quality assurance for each drill rig and backhoe. Guild will provide a "clean man" in the field to aid in decontamination of the drilling and engineering personnel. Contaminated items and cleaning solutions from the exploration program will be packed in 55-gallon drums at the site. The NED-USACE will remove the drums from the site at the completion of the field investigation.

6. HAZARD ASSESSMENT

The health hazards associated with the above field exploration activities for the water borings will be generally chemical in nature, and include respiratory and dermal hazards. (Physical hazards such as noise and slippery working surfaces may also be present, and although not specifically addressed in this Plan, appropriate precautions must be taken in accordance with applicable USACE safety and health regulations. The U.S. Army Corps of Engineers Safety Manual EM 385-1-1 will be the guide for safety practices.) The chemical hazards of concern for this project are PCB's (polychlorinated biphenyls) found in sediments, as well as relatively high concentrations of toxic heavy metals, particularly lead and chromium.

PCB's consist of a mixture of chlorinated biphenyls which contain a varying number of substituted chlorine atoms on aromatic rings. The persistence in the environment and the toxicity increases as the chlorine content increases. The commercial products of the complex chlorobiphenyls were registered and manufactured under the trademark "Aroclor". The highest concentrations of Aroclor's detected in the Upper Acushnet Estuary sediments were for Aroclor 1254 (54% chlorine) and Aroclor 1248 (48% chlorine). Such PCB's are strongly absorbed onto solid surfaces such as soils and sediments; in aquatic environments they are associated with the sediments in high concentrations rather than in the water in contact with them.

The major routes of PCB entry into the body are inhalation, ingestion, and skin and eye contact. Target organs are the skin, eye, liver, kidneys. Major symptoms of PCB exposure include eye irritation, dermatitis (notably chloracne), hepatic degeneration, fatigue, dark urine, and jaundice. The above routes of exposure are also applicable to the toxic heavy metals identified. Specific health effects and hazards for the toxic chemicals identified on site are described in Appendix A - Hazard Evaluation of Chemicals.

Occupational exposure limits (PELs and TLVs) have been established for certain PCB's and heavy metals in air which are present in the sediments to be sampled. These limits are average concentrations in air to which individuals can presumably be exposed without harm during an average work day (8 hrs) and work week (5 days). See Appendix B for applicable standards.

Volatilization of PCB's to harmful airborne vapor levels and/or increased airborne particulate concentrations, containing PCB's or heavy metals, during field sampling operations are not likely due to the low vapor pressures of the PCB's and the wet characteristics of the sediment material itself. However, due to the toxicity of these materials,

complete dermal as well as respiratory protection will be required when handling and cleaning sampling tubes containing contaminated sediments.

The overall hazard rating for the sediment sampling activities is considered to be low-moderate, requiring modified EPA - Level C protective equipment for adequate respiratory and dermal protection. The site specific personal protective equipment to be utilized is detailed in the following Personnel Protection section.

7. GENERAL HEALTH AND SAFETY DIRECTIVES

Medical Monitoring

All personnel assigned to on-site work associated with the water borings for this project must be active participants in a complete medical surveillance program, pursuant to EP 385-1-58. The required medical surveillance program consists of a complete medical examination and certification as to fitness for work under the specific site conditions, prior to on-site operations, at the conclusion of work and/or at 1-year intervals. The medical examination should include the following, as a minimum:

- medical history
- work history
- vital signs
- physical examination of all major organ systems
- audiogram
- vision screening
- chest x-ray (if previous work history warrants)
- electrocardiogram
- complete blood count with differential
- blood chemistry screen - SMAC 21 test survey
- urinalysis
- pulmonary function test (including FEV 1.0 and FVC)

Training

All personnel assigned to on-site work associated with the water borings must have received formal training in the use of personal protective equipment equivalent to EPA - Level C and previous on-the-job training for the tasks they are assigned to perform, in accordance with OSHA regulation 29 CFR 1910.120. Site specific training and on-site orientation training will also be required to be given to all personnel who will be potentially exposed to contaminants, and will include the following:

- Health effects and hazards of the chemicals identified or suspected to be on site.

- Personnel Protection, including use, care, and fitting of protective equipment, the necessity for such equipment, and its limitations and effectiveness.
- Decontamination procedures
- Safe work practices and procedures
- Emergency procedures
- Medical requirements

Prohibitions

Eating, drinking, and smoking are prohibited in any areas where contaminated materials are present or suspected.

Facial hair, features, or other protective equipment that interferes with proper fit of respirators shall not be permitted for those required to wear respirators during sampling operations.

8. PERSONNEL PROTECTION

The protective equipment required to be worn by personnel actually drilling through and sampling contaminated sediment are listed below. . The requirements are essentially a modified EPA - Level C, less stringent than EPA - Level C, but more protective than EPA - Level D. Equipment specifications are based upon the foregoing hazard assessment and site specific conditions. Protective suits, gloves, and boots shall be made of materials resistant to the chemicals identified to be present in the sediments to be sampled and handled. All respirators shall be NIOSH/MSHA certified.

Respirator: Half-mask respirator with air purifying cartridges for protection against organic vapors and dusts, fumes, and mists with with PELs not less than 0.05 mg/m^3 (pesticide pre-filters). All respirators shall be individually assigned to personnel. Respirators may not be required at all times during the field exploration activities. The designated GEI on-site coordinator will monitor air quality and soil sampling during drilling operations using an HNU photoionization unit. The GEI project manager or designated on-site coordinator will assess the need for respirators as the field exploration activities progress.

Coveralls:	Disposable, Saranex-laminated, Tyvek coverall suits; one-piece with attached hoods and booties. (Duct tape should be used to close/seal the overlap between coverall sleeves and gloves, and pantlegs and boots.)
Gloves	Nitrile outer gloves (medium duty-10 mils/medium length). Viton inner gloves. Cotton jersey gloves may be used between the Viton inner gloves and the skin for absorption of perspiration and further dexterity.
Boots	Neoprene overboots worn over the Saranex Tyvek booties.
Eye Protection	Fog-free chemical splash goggles shall be worn with the specified half-face respirators during all sampling and decontamination operations. Face shields may be worn instead.
Hard Hats	Hard hats are to be worn at all times.

The personnel assigned to be the "clean" assistants to the sampling and decontamination operations, who will not be in direct contact with contaminated materials nor in the immediate area of these operations, will not be required to wear the prescribed respiratory protection, but shall wear, as a minimum, the coveralls, outer gloves and overboots.

DECONTAMINATION PROCEDURES

Decontamination of personnel and equipment is necessary to prevent hazardous materials from being transferred from contaminated areas to clean areas. Procedures for personnel and equipment decontamination shall be designed to be appropriate for the types of contaminants present, the personal protective equipment and other equipment utilized, and the operations taking place.

Personnel

All personnel participating in the drilling and sampling operations on the barge shall remove all protective clothing and equipment and wash their faces, necks, and hands prior to leaving the site and/or prior to eating, drinking, or smoking. The project manager or the on-site coordinator shall be

responsible for identifying appropriate areas for donning and doffing protective equipment, for setting up facilities for equipment decontamination and field washing of personnel, and for seeing that all decontamination procedures are properly followed.

Personnel wearing the prescribed protective equipment should adhere to the following decontamination procedures; however they may be modified in accordance with site-specific conditions and protective equipment used (See NED-USACE SOP in Appendix C).

1. Equipment Drop: A plastic sheet and/or containers lined with plastic bags shall be used to deposit contaminated equipment (e.g. tools, sampling devices, etc.). Equipment should be segregated depending upon degree of contamination to reduce the probability of cross-contamination.

2. Overboot and Outer Glove Wash: Overboots and outer gloves are to be washed with a detergent/water solution, using long-handled soft-bristled scrub brushes.

3. Overboot and Outer Glove Rinse: Rinse off decon solution from Step 2 using generous amounts of clean water. Remove tape seal from wrists and legs.

4. Overboot and Outer Glove Removal: Place overboots in a separate lined storage container for re-use until material integrity is compromised. Dry boots prior to next day's use. Place outer gloves in plastic lined container for disposal at the end of the day or sooner if they are damaged.

5. Chemically-resistant Coverall Removal: Remove protective coveralls and discard them into the appropriate container at the end of the day or more often as necessary due to rips, tears, etc.

6. Inner Glove (VITON) Wash: Wash inner gloves with detergent/water solution.

7. Inner Glove (VITON) Rinse: Rinse inner gloves with water.

8. Respirator Removal: Remove respirator taking care not to touch the face with gloves. Remove cartridges from respirator after wearing for a full day or when breathing becomes difficult, and place them in a lined container for disposal. Place respirator face piece in lined storage container for subsequent daily cleaning, sanitizing and drying.

9. Re-wash and Rinse Inner Gloves.

10. Inner Glove (VITON) Removal: Remove inner gloves and place in lined storage container for re-use until the material integrity is compromised. The gloves should be taken to a clean area where they can be air dried prior to the next day's use. Remove and discard or wash/dry the cotton jersey glove liners.

11. Field Wash: All personnel wearing protective clothing and equipment shall, at a minimum, wash their faces, necks, and hands before leaving the site and/or before eating, drinking, or smoking. A complete shower is required to be taken after returning to place of lodging.

Equipment

All non-disposable equipment used where contact with contaminated sediment material may occur must be decontaminated either on site or placed in sealable, secure containers and properly decontaminated off site. Respirator face pieces, VITON inner gloves, and re-usable overboots shall be washed, dried, and inspected for missing parts and condition. They shall then be stored in clean, dry areas at the end of the day, ready for next day's use. Contaminated sampling equipment and tools shall be washed with detergent/water solution and rinsed with clean water. Proper care must be taken into the immediate sampling area, the outside of it must be thoroughly washed before placed in the transport vehicle. If there is any possibility that the outside of the sampling tubes themselves may be contaminated, GEI must be notified.

Wash water from the decontamination procedures (personnel and equipment) will be allowed to runoff back into the sampling environment from which the samples came. Previous lab analyses of wash waters generated at this site during identical trial operations revealed no detectable contamination.

All contaminated disposable equipment, including coveralls, outer gloves, respirator cartridges/pre-filters, etc. shall be placed into heavy plastic bags or impermeable containers. The NED-USACE will remove and dispose of the containers off site in an approved manner.

10. COMMUNICATIONS

On-site Communications: It is anticipated that during the drilling activities, no special communications systems will be required. Emergency hand signals are described below under General Emergency Procedures.

Communications with Emergency Facilities: Telephone communications with emergency response personnel should be used. Nearby emergency facilities shall be advised of the drilling activities so that they can be prepared to respond to any emergency. Telephone numbers are given in Appendix D - Emergency Information.

11. HEAT STRESS MONITORING AND RECOGNITION PROCEDURES

Ambient temperatures during site sampling activities combined with the requirements for personal protective equipment may create heat stress for on-site workers. Procedures for recognizing, monitoring, and avoiding heat stress must be followed. (See Appendix E - Standard Operating Procedures for Emergencies due to Heat and Heat Stress Monitoring)

12. EMERGENCY RESPONSE PROCEDURES

In the event that an emergency develops at the work site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field sampling crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General Emergency Procedures

The following emergency procedures shall be followed:

a. Personnel on site shall use the "buddy" system (pairs).

b. Hand signals for communication while wearing respirators are suggested.

1. Hand gripping throat: cannot breathe.
2. Grip partner's wrist or place both hands around waist: leave area immediately, no debate.
3. Hands on top of head: need assistance.
4. Thumbs up: O.K., I'm alright, I understand.
5. Thumbs down: No, negative.

c. Visual contact shall be maintained between "buddies" with other team members in close proximity in order to assist in case of emergencies.

d. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on site, the entire field crew should immediately halt work and act according to the instructions provided by the project manager and/or on-site coordinator.

e. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.

f. In the event that an accident occurs, the project manager shall complete appropriate reports and notify appropriate personnel, immediately.

Personal Injury

In case of personal injury at the sampling site, the following procedures shall be followed:

a. Emergency rescue personnel/ambulance shall be notified by radio or telephone immediately. An ambulance will be dispatched to the site, and the injured person shall be evacuated to the nearest emergency medical facility. The staff of the medical facility shall be advised that the patient's clothing and skin may be contaminated with site-specific chemicals.

Chemical Exposure

If a member of the field sampling crew is exposed to chemicals, the procedures outlined below shall be followed:

a. Another team member (buddy) should remove the individual from the immediate area of contamination.

b. Precautions shall be taken to avoid exposure of other individuals to the chemical.

c. If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.

d. If the chemical has contacted the skin or eyes, they shall be washed with copious amounts of clean water.

e. All chemical exposure incidents shall be reported in writing.

13. EMERGENCY CONTACTS

Telephone numbers or instructions for contacting outside assistance or support services are given in Appendix D and shall be available to all on-site personnel in the event that any situation or unplanned occurrence arises where such assistance is required.

PREPARED BY: Stephen L. Whiteside
Project Manager
GEI

APPROVALS:

_____
Mark Otis, Project Manager
New England Division/USACE

APPENDIX E

DAILY ACTIVITY LOGS

DAILY ACTIVITY LOG

Date	Activity
September 14, 1987	Mark Mahoney (GEI) met with drillers Paul Didden and Peter Vieira (Guild Drilling) onsite at 0650. Set up boring PD-22. Driller and sampled from 0 to 22 feet.
September 14, 1987	Completed boring PD-22. Drilled and sampled 0 to 41.0 feet. Jack Enos and Tom May (GEI) arrived onsite 0815. Tom May took over inspection of land based drilling crew. J. Enos and M. Mahoney laid out land borings and points on land to position barge borings and determined elevations of proposed boring locations. Guild Drilling arrived onsite 1100 hours and set up barge. Paul Schmmelfenyg and Jack Fowler (USACE) were onsite most of the day to observe operations. Land drill crew began PD-21 but discontinued operation because elevated level (15 ppm) of volatile organic compounds (VOC) detected on HNU photo-ionization device when borehole was advanced to 4 feet.
September 16, 1987	Barge drilling crew (Donald Serowik, Peter Brown) laid out buoys for 5 water borings and set up on PD-33. Performed Field Shear Vane Tests (FSVTs). Land drilling crew set up on PD-23 and drilled and sampled from 0 to 34.3 feet and cored five feet of rock from 34.3 to 39.3 feet. P. Schimmelfenyg, J. Fowler, and B. Pastorimi were on site to observe operations.
September 17, 1987	Land drilling crew set up on PD-24 and drilled and sampled to refusal at 40 feet. Began PD-20 and drilled and sampled to 8 feet. Barge drilling crew completed PD-33. Drilled and sampled 0 to 22 feet. Set up on PD-34, performed 2 FSVTs and drilled and sampled to 12 feet. Tom Trainor of EC Jordan was on site most of the day to observe operations.
September 18, 1987	Land drilling crew completed PD-20, drilled and sampled to 25 feet, set up on PD-21 (relocated because of elevated VOC at original proposed location) and completed, drilling and sampling 0 to 25 feet. Barge

	crew completed PD-34, drilling and sampling to 17 feet. Conducted safety meeting.
September 21, 1987	Backhoe provided by Guild Drilling to excavate test pits on site. Operator is Bob Tobey. Six test pits excavated. Two representatives of Massachusetts DEQE onsite to observe test pit excavations along with Brian Kilcoyne and Steve Whiteside (GEI). Forrest Knowles (USACE) onsite to take soil samples from test pit excavations. Barge drilling crew set up on PD-34A and drilled and sampled 0 to 9.5 feet. Set up on PD-27 and performed 3 FSVTs. Conducted safety meeting.
September 22, 1987	Test pit excavations completed. Barge drilling crew completed PD-27. Drilled and sampled 5.4 to 32 feet. Set up on PD-31 and performed 8 FSVTs.
September 23, 1987	Completed PD-31. Drilled and sampled 14.4 to 17 feet. Set up on PD-29 and drilled and sampled 0 to 32 feet.
September 24, 1987	Set up on PD-30. Completed PD-30. Drilled and sampled 0 to 17 feet. Set up on PD-32. Drilled and sampled 0 to 17 feet. Swimming pools used for retention of decontaminant wash and M. Mahoney's boots and gloves stolen during lunch break. All future decontamination on plastic tarpaulin with decontaminant fluid draining back into harbor.
September 25, 1987	Finished PD-32. Drilled and sampled 17 to 22 feet. Set up on PD-26. Completed PD-26. Drilled and sampled 0 to 22 feet. Set up on PD-25.
September 28, 1987	Finished PD-25. Drilled and sampled 0 to 22 feet. Set up on PD-28. Finished PD-28. Drilled and sampled 0 to 17 feet. Decontaminated all tools and equipment. Recommended to D. Serowik that steam cleaner be used 9-29-87 to decontaminate barge, drill rig, work boat, etc., prior to loading for demobilization.

APPENDIX F

SAFETY REPORTS

GEOTECHNICAL ENGINEERS INC.

WEEKLY SAFETY MEETING

To: Safety Officer, NED

Date Held: 9-18-87

From: Field Engineer

Time: 1245

Thur: Project Manager

Weekly safety meeting was held this date for the following personnel:

Contract No. DACW33-87-D-0002

Personnel present:

Conducted by: M. Mahoney

D. Serowik, P. Brown, C. Diggle, P. Vieira, P. Didden - Guild
M. Mahoney, T. May - GEI

1. Subjects discussed (Note, delete, or add):

Accident Prevention Plan
Individual protective Equipment - Hard hats, (tyveks and respirators for barge crew), goggles

Sanitation, First Aid, Waste Disposal - Proper disposal of tyveks, respirator cartridges, tape, decontamination S.O.P.

Hand Tools, Portable Power Tools, Woodworking Machinery Equipment Inspection and Maintenance (Zero Defects) -

Hoisting Equipment -
Ropes, Hooks, Chains, and Slings -

Water Safety - Life jackets present for all barge cres members
Toxic Materials - Discussed HNU monitoring, effects of exposure to PCBs

Prepared by: Mark Mahoney
Onsite exposure Hours: 9-14-87 to 9-18-87

Guild: P. Didden - 40 hr D. Serowik - 32 hr GEI: J. Enos - 8 hr
P. Vieira - 40 hr P. Brown - 32 hr. T. May - 32 hr
C. Diggle - 32 hr M. Mahoney - 40 hr

GEOTECHNICAL ENGINEERS INC.

WEEKLY SAFETY MEETING

To: Safety Office, NED

From: Field Engineer

Thur: Project Manager

Date Held: 9-21-87

Time: 1000

Weekly safety meeting was held this date for the following personnel:

Contract No. DACW33-87-D-0002

Conducted by: M. Mahoney

Personnel present:

D. Serowik, P. Brown, C. Diggle - Guild
M. Mahoney, B. Kilcoyne - GEI

1. Subject discussed (Note, delete, or add):

Accident Prevention Plan
Individual Protective Equipment - Hard hats, goggles, tyveks, respirators

Sanitation, First Aid, Waste Disposal - Decontamination S.O.P.

Hand Tools, Portable Power Tools, Woodworking Machinery
Equipment Inspection and Maintenance (Zero Defects) -

Hoisting Equipment -
Ropes, Hooks, Chains, and Slings -

Excavations - Test pits
Loose Rock and Steep Slopes -
Explosives -
Water Safety - Life jackets present for all barge cres members
Toxic Materials - Discussed HNU monitoring, decontamination of drilling equipment, workboat, etc., prior to removal from job site at end of job

Prepared by Mark Mahoney
Onsite Exposure Hours: 9-21-87 to 9-25-87

Guild: C. Diggle - 40 hr
D. Serowik - 40 hr
P. Brown - 40 hr

GEI: M. Mahoney - 40 hr
B. Kilcoyne - 16 hr
S. Whiteside - 4 hr

APPENDIX G

NED-USCE SCOPE OF WORK

SCOPE OF WORK

FOR

EXPLORATION PROGRAM

NEW BEDFORD SUPERFUND SITE

BRISTOL COUNTY, MASSACHUSETTS

24 June 1987

1. PROJECT IDENTIFICATION.

a. Authority. The United States Army Corps of Engineers (USACE) has been tasked by the Environmental Protection Agency (EPA) with additional predesign studies for the New Bedford Superfund site. The purpose of these studies will be to develop technical information and to evaluate the engineering feasibility of various dredging and disposal alternatives for the upper harbor. In support of these studies the New England Division (NED) of USACE has been assigned project management responsibilities for a pilot study of dredging and disposal alternatives. Project activities are funded by EPA, Region 1.

b. Project Site. New Bedford Harbor, New Bedford, MA

2. PROJECT DESCRIPTION.

New Bedford Harbor, a tidal estuary, is situated between the City of New Bedford on the west and the towns of Fairhaven and Acushnet on the east at the head of Buzzards Bay, Massachusetts. The harbor sediment contains elevated levels of polychlorinated biphenyls (PCB's) and heavy metals. The northern portion of the site extending from the Coggeshall Street Bridge north to the Wood Street Bridge contains the highest concentration of contaminants.

The pilot study of dredging and disposal alternatives will be conducted in the vicinity of a small cove located just north of the Coggeshall Street Bridge on the New Bedford side of the harbor. Three types of dredges will be evaluated with the dredge material being placed in two types of disposal facilities. A Confined Disposal Facility (CDF) will be constructed partially on land and partially in water along the south side of the cove as shown on the attached exploration plan. Material will be dredged and placed in the CDF leaving an excavated area below the water level that will be used as the second type of disposal facility described as Confined Aquatic Disposal (CAD).

3. ITEMS FURNISHED BY THE GOVERNMENT.

Attachment 1: Exploration Plan

Attachment 2: Boring Logs

Attachment 3: Laboratory Test Results

Attachment 4: Safety Plan

Attachment 5: Hydrographic Survey

Attachment 6: Control Point Descriptions

Attachment 7: Aerial Photo

Attachment 1 is enclosed. Attachments 2 to 7 have been furnished separately.

4. ARCHITECT/ENGINEER SERVICES.

a. Administer exploration program described below:

(1) The purpose of the explorations is to study engineering properties of the subsurface conditions along the proposed CDF alinement. Boring and sampling shall be performed in accordance with American Society of Testing and Materials (ASTM) D 420. Work shall consist of 10 borings on water, 5 borings on land, and 12 (approximately) test pits on land. Land sites will require Level D protection (no significant contaminants known). Water sites will require protective clothing primarily because of PCB contamination.

(2) The exploration plan shall consist of (depths are approximate):

3 borings 40 feet deep on land
2 borings 25 feet deep on land
12 (approximately) test pits on land
2 borings 30 feet deep on water
8 borings 15 feet deep on water

(3) Borings shall be advanced to required depth or refusal, whichever occurs first, except as otherwise required herein. Refusal is defined as 50 blows with no penetration during a standard penetration test (SPT). Casing or hollow stem auger shall be used, if necessary, to keep boreholes open. Systematic drilling and reaming of the casing may be required to advance the borehole if extremely compact glacial till, boulders, or a concentration of boulders is encountered. Sampling and testing shall only be performed at the bottom of clean boreholes. Care shall be taken when working within the upper three feet of estuary sediment since this material may be contaminated with PCB's, heavy metals, and organic solvents.

SPTs shall be performed in accordance with ASTM D 1586. SPTs shall be taken continuously through the surficial fill and at 5 foot intervals below the fill in land borings. SPTs shall be taken immediately below the surficial organic soils and at 5-foot intervals thereafter in water borings.

Hand cranked, 8-inch diameter, field shear vane tests (FSVTs) shall be performed in accordance with ASTM D 2573. Casing and hollow stem augers will not be required to keep the boreholes open during FSVTs. Continuous FSVTs shall be executed through the entire layer of surficial organic soils in explorations PD-25, PD-26, PD-28, PD-31, PD-32 and PD-33, as shown on Attachment 1: Exploration Plan. Continuous FSVTs shall be executed through the contaminated layer of surficial organic soils (top three feet) in borings PD-27, PD-29, PD-30, and PD-34.

Thin-walled tube samples (TWTSs) shall be taken in accordance with ASTM D 1587. Continuous TWSTs shall be executed through the entire layer of uncontaminated organic soils in borings PD-27, PD-29, PD-30 and PD-34.

Diamond core drilling (DCD) shall be executed in accordance with ASTM D 2113. DCD shall be used to advance land borings through obstructions in the fill. DCD shall be used below the fill, if necessary in borings PD-22, PD-23, and PD-24 to reach required depth.

(4) All disturbed samples shall be extruded from the sampler, classified in accordance with the Unified Soil Classification System, and described in accordance with ASTM D 2488. Field boring logs shall be prepared for each boring which indicate sample, number, description, location, classification, dividing lines between strata, and SPT blow counts. Adequate amounts of each disturbed sample shall be saved to perform any required physical tests. All material remaining after samples have been selected shall be distributed on site.

(5) Test pits shall be excavated on land by backhoe to study the nature of the surficial fill and buried foundations under and within the proposed CDF. Test pits shall be excavated at the locations shown on the exploration plan (Attachment 1) and at other selected locations to uncover buried foundations. Each test pit shall fully penetrate the man-made fill. It is estimated that approximately 12 test pits up to 10 feet in depth will be required. The test pit excavations shall conform to applicable safety requirements. Bag samples shall be taken of the excavated material in the top five feet if it appears that it can be used for dike construction. Each test pit shall be backfilled in two-foot layers which are tamped with the back of the excavator's bucket.

(6) Soils and materials encountered during the test pit excavation operation shall classified in accordance with the unified classification system, and described in accordance with ASTM D 2488. Test pit logs shall be prepared for each test pit which indicate, sample, number, soil description and classification, location, dividing lines between strata, and shape and dimensions of buried foundations. Locations of the buried foundations should be shown on the exploration plan.

(7) The estuary bottom was surveyed and is known to have areas of very shallow water as shown on Attachment 5: Hydrographic survey. The mean tidal fluctuation is 3.7 feet. Locations shown in water are approximate. It is recognized that some points may not be readily accessible by the floating drilling plant due to the variable bottom conditions and fluctuating water levels. The boring contractor shall drill as close as is practical to the given locations. Local tide charts shall be used to plan work.

(8) All explorations shall be surveyed for location and elevation in accordance with the survey control points established by NED and shown and described on Attachment 5: Hydrographic Survey and Attachment 6: Control Point Description. Locations of individual explorations shall be scaled from Attachment 1: Exploration Plan.

(9) Rights-of-Entry for the work have been obtained by NED.

(10) Representatives from the exploration contractor (s), Geotechnical Engineers Incorporated (GEI) and Paul Schimelfenyg of NED (617-647-8394) shall arrange for a joint site visit to view the exploration locations prior to the start of field work.

(11) GEI shall contact Marcy Wetherbee, Environmental Coordinator, City of New Bedford (617-999-2938, ext. 287) and notify her when field work will be performed.

(12) Contaminated items and cleaning solutions from the exploration program shall be packed in 55 gallon drums. Removal of the drums shall be coordinated with Mr. Forrest Knowles, NED Materials Laboratory at 617-647-8793.

b. Develop site safety plan for exploration program.

c. Provide inspection and quality assurance of the exploration program. All work shall be in accordance with the approved Health and Safety Plan. Air quality and soil sample monitoring shall be part of the routine inspection procedure. Only qualified and experienced personnel shall be employed for this work.

d. Perform laboratory testing on selected soil samples to better define the properties of the subsurface soils. It is not anticipated that laboratory personnel will be subjected to significant concentrations of contaminants. The laboratory testing program shall consist of physical soil tests required by the GEI laboratory classifier to accurately classify the samples, and Paul Schimelfenyg of NED (617-647-8394) to aid in dike design. Classifications shall be performed in accordance with ASTM D 2487. A list of tests, test methods and estimated quantities of tests follows:

Moisture and Organic Contents ASTM D 2974	6
Particle-Size Analysis ASTM D 421, ASTM D 42	10
Specific Gravity ASTM D 854	6
Atterberg Limits ASTM D 4318	6
Consolidation ASTM D 2435	2
Triaxial Shear (Q Test) Engineering Manual EM 1110-2-1906	4
Triaxial Shear (R Test) EM 1110-2-1906	2

Unit price costs of tests shall be provided so that adjustments to the total estimated cost can be made.

e. Prepare Exploration Report which shall contain Scope of Investigation, Safety Plan, Quality Control, Summary of Activities, Chain of Custody logs, Safety Reports, Field Inspector's Logs which show corrections by laboratory classifier, and laboratory test results.

5. COORDINATION.

Liaison will be maintained for the duration of the delivery order through frequent telephone contacts and meetings held at the request of the points of contact at NED, Paul Schimelfenyg (617-647-8394) and Yuri Yatsevitch (617-647-8387). Daily telephone contacts shall be required between the GEI inspector and the NED points of contact during field work.

A meeting shall be held after submittal of the draft exploration report to discuss the report. The Government will schedule the meeting approximately seven days after receipt of the draft report.

6. COMPLETION SCHEDULE.

All work under this delivery order shall be completed within the following time limits:

Submission of Draft Exploration Report	Within 28 days from notice to proceed
Submission of Final Exploration Report	Within 7 days of Government review comments

7. GOVERNMENT REVIEW

The Government review will take approximately ten calendar days from receipt of draft report. Three copies of the final geotechnical report shall be submitted no later than seven calendar days after your receipt of Government-reviewed draft report including the action taken on possible comments.

8. QUALITY CONTROL.

Your attention is invited to the Contract General Provisions, "Responsibility of the Architect-Engineer" and "Design Within Funding Limitations". You will be held responsible for the quality of the report submitted and for all damages caused the Government as a result of your negligence in the performance of any services furnished under the contract.

Although submissions required by your contract are technically reviewed by the Government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you make shall include a certification that the submission has been subjected to your own review and coordination procedures to insure (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) professional and technical accuracy of the submission. Documents which are significantly deficient in any of these areas will be returned to you for correction and/or upgrading prior to completing our review. Contract submission dates will not be extended if a resubmission of draft material is required for this reason. It is requested that you indicate in writing in your fee proposal letter your cognizance of this requirement and that your firm and your associates, if any, have the professional competency and technical expertise necessary to accomplish this project in a satisfactory manner.